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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

APOLLO 16

MISSION DIRECTOR'S PRESS BRIEFING

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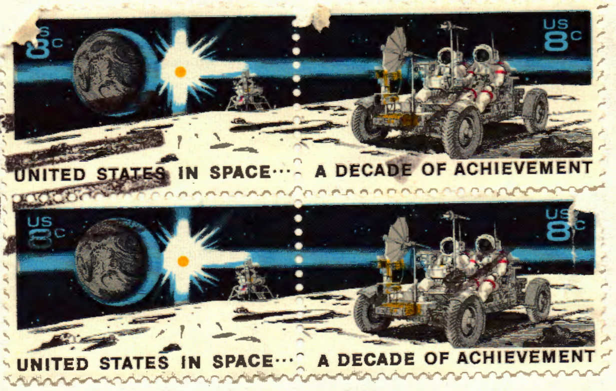
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Chester M. Lee,
Apollo Mission Director. 3

Kenneth C. Atchison,
OMSF Public Information Officer

PROCEEDINGS

ATCHISON: Good afternoon.

We have two briefings for you today. The first is the Apollo Mission Director's press briefing by Mission Director Chester M. Lee. After the Chet Lee briefing we will have a briefing on medical aspects of Apollo 15 and 16, by Dr. Charles A. Berry, the NASA Director for Life Sciences.

We will follow the normal routine. After each briefing we will have questions and answers. Please wait for the mike.

We also have a handout of the Mission Director's briefing, of the slides. And we have envelopes in the rear. If you will self-address the envelope we will send you a copy of the transcript.

It is my pleasure now to introduce Captain Chester M. Lee.

LEE: Good afternoon, ladies and gentlemen.

What I would like to do today is go through the Apollo 16 mission in the usual detail, which I am sure many of you are quite familiar with. I will try to highlight the differences of the mission. Some of the viewgraphs I may be going through fairly quickly. If you do have questions and I am not going into enough detail for you, please don't hesitate to interrupt and ask questions because I don't want to repeat some of the old stuff too much for you with Chuck Berry's briefing coming up. I don't want to hold you too long.

(Slide.) (not included herewith)

Displayed here, of course, is the seal for the Apollo 16 crew and the crew itself with John Young being the old hand of the crew and Charlie Duke's first flight and, of course, Ken Mattingly, the measles from Apollo 13 is getting another crack on Apollo 16 here.

Next viewgraph, please.

(Slide.) (not included herewith)

I might add before I go into some of the science rationale that we did have our flight readiness review on Friday. Dr. Petrone gave the go to proceed and we proceeded with the hypergolic loading. We are in the process of doing that this morning which, you know, commits us to the three-month capability once we get the hypergols loaded.

With regard to the science rationale of the Descartes site, on my left here we have shown you the previous sites. We have Apollo 16, the Descartes site, which is in the highlands. It is part of the Descartes formation. The Descartes crater, for which this formation is named for, is about 80 kilometers to the south.

We have also shown we have now selected for Apollo 17 Taurus Littrow which will be up here, just on the edge of the Mare Serintatus. And LUNA 20, for those of you who are not familiar with it, recently landed and brought back a sample for Russia, was about in this area here (indicating).

So you can see that we are getting, with the limited flights that we have, a pretty good variation of the moon's front surface.

We have been limited somewhat, of course, by the extremes in latitude. Apollo 15, of course, was the greatest variation in latitude we have made.

We are predominantly very interested, of course, in getting into the highland area and I think on the right you see the rationale as compared with Apollo 11, 12, 14 and 15. We are going to the highlands' hills and plains for the first time.

I have tried to ask the geologists and our science people for some comparison here on earth to the Descartes site, but I was trying not to get geologic comparison but a physical comparison because the Descartes site is about 7000 above the mare sea level, so to speak, and it is a plain in the highlands. And this probably, they tell me, could be equated to some of the park sites north of Colorado Springs where you are at a high elevation but you have a relatively flat plain.

As far as the ages go of the material, we have hopes that in this area we will get material samples brought back that have ages somewhere between 3.5 to 4 billion years of age.

So we are interested not only in getting the composition and age of the highland construction but also the composition age of the Cayley formation which is somewhat perhaps like the mare formation. It is a flow, but we feel that the Cayley is older than the mare.

Next viewgraph, please.

(Slide.) (1)

With regard to the primary objectives, you have seen these before so I won't dwell on them and go to the next viewgraph.

(Slide.) (2)

Now, to carry out these objectives we have our lunar surface science plan and also -- which I will go into -- the orbital science plan.

As you will notice, I have colored in yellow here the really only two new experiments we are carrying.

We are repeating the passive seismic. It is essentially the same. Of course this gives us our network and is in a highland location which is different than we have had before so we hope to get some valuable information from that.

The active seismic we did fly on Apollo 14. We haven't fired those grenades yet. We will fly and place an active seismic that is quite similar except we have made some improvements in the platform to insure us, give us greater

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PRIMARY OBJECTIVES DESCARTES

1. PERFORM SELENOLOGICAL INSPECTION, SURVEY, AND SAMPLING OF MATERIALS AND SURFACE FEATURES IN A PRESELECTED AREA OF THE DESCARTES REGION.
2. EMPLACE AND ACTIVATE SURFACE EXPERIMENTS.
3. CONDUCT IN-FLIGHT EXPERIMENTS AND PHOTOGRAPHIC TASKS.

LUNAR SURFACE SCIENCE PLAN

	EXPERIMENT		11	12	14	15	16
ALSEP	S-031	PASSIVE SEISMIC	X	X	X	X	X
	S-033	ACTIVE SEISMIC			X		X
	S-034	LUNAR SURFACE MAGNETOMETER		X		X	X
	S-035	SOLAR WIND SPECTROMETER		X		X	
	S-036	SUPRATHERMAL ION DETECTOR		X	X	X	
	S-037	HEAT FLOW				X	X
	S-038	CHARGED PARTICLE LUNAR ENVIRONMENT			X		
	S-058	COLD CATHODE IONIZATION		X	X	X	
	M-515	LUNAR DUST DETECTOR		X	X	X	
	S-059	LUNAR GEOLOGY INVESTIGATION	X	X	X	X	X
	S-078	LASER RANGING RETRO-REFLECTOR	X		X	X	
	S-080	SOLAR WIND COMPOSITION	X	X	X	X	X
		LUNAR SURFACE CLOSE-UP CAMERA	X	X	X		
	S-152	COSMIC RAY DETECTOR (SHEETS)					X
	S-198	LUNAR PORTABLE MAGNETOMETER			X		X
	S-200	SOIL MECHANICS			X	X	X
	S-201	FAR UV CAMERA/SPECTROGRAPH					X

confidence that when we fire the grenades we won't be flopping around and getting lined up incorrectly for the second grenade firing.

The lunar surface megnetometer we have improved the heads, the sensitivity of the heads.

The heat flow experiment is essentially the same. This is a very high priority experiment on this mission because of what we feel is an anomaly, the unusual characteristics we are getting from the Apollo 15 heat flow. We want to see if that is an anomalous area on Apollo 15 or whether we are going to get something different.

Very few changes.

We have improved the drill and the bore so that we hope that we won't run into the problems that we had in drilling that we did on Apollo 15.

Now, we also learned that we don't have to implant the sensing transducers and so forth as deep as we thought we had to on Apollo 15 so I think we will probably go down two and a half meters compared to three meters which we wanted to get on Apollo 15.

The lunar geology investigation is very much the same as we have done in the past. One new item we are after here is a surface sample, and by that I mean the top micron -- several -- 500 micron layer of the lunar surface. They feel that this has an -- has something to do with the changing albedos that we see constantly on viewing the moon. So we are going to try to bring back some sample. It just gets up to 500 microns, something like that, of the top lunar surface soil.

QUESTION: Will you take questions now or later?

LEE: Go ahead, Bill.

QUESTION: On that one, what device will you use to scoop up only 500 microns which is half a millimeter?

LEE: They have -- I will show you, if you will remind me, Bill, a picture of it. But let me just briefly say that there are two devices that we are looking at. One of them we are pretty well finalized on. It is like a velvet that just touches lightly the surface. And we are looking at another one that we haven't finalized. The velvet they think will get around anywhere from 100 to 500 microns. We are looking at another one that maybe will get 100 microns and less.

May I have the next viewgraph, please?

(Slide.) (not included herewith)

One of the new experiments is a cosmic ray detector. Sheets will be carried. They are mounted on the LM. They will be mounted during the final count.

There are four panels. They are exposed during the translunar coast. When they get to the surface they will pull a ring which changes Panel 4, I believe. The others remain the same. But it does change Panel 4 so that we can then have a reference of what we have gathered while on the lunar surface itself.

Following -- it is passive. It just sits there throughout the entire lunar stay until the end of the third EVA at which time a pulley -- the third ring -- the second ring is what shifts the panels. It is the third ring then which pulls it off and then it folds up and is stowed in the LM and transferred to the command module and returned to earth. And, as pointed out on the viewgraph, we are after low energy heavy cosmic ray particles, light solar wind particles and thermal neutrons.

Next viewgraph, please.

(Slide.) (not included herewith)

I might add that on the lunar portable magnetometer which is a repeat we have made -- that was carried on Apollo 14. You will recall Ed Mitchell taking some readings that were a little higher than we had expected.

We had problems. It is on a reel that they take during a traverse. We had some problems in reeling up the tape and we have improved the ratchet affair on this and we hope we won't run into the same difficulty.

Soil mechanics, again, is pretty much the same as in the past. We have made some improvements on the magnetometer. You will remember Jim Erwin used a press into the surface and that was a little difficult to do. We didn't get as good readings as we wanted. We have made some improvements and we hope we will get better information on the penetrometer.

Now, a new experiment for this mission is the far ultraviolet camera spectrograph. A picture of it is shown on the right screen.

(Slide.) (not included herewith).

The gold plating is for thermal protection. We had wanted an active thermal protection but it was too much weight so we have gone to a passive thermal protection. And, as you can see from the description here, we hope to get evidence of intergalactic hydrogen and information on a magnetosphere of earth.

Now, this is carried near the third bay, near the ALSEP bay, as I recall, and it is in a bag. It is humidity controlled, and when you get to the surface John Young will open the bag and this will deploy in the shadow in front of the LM. And I will show you a diagram a little later. Going to keep this in the shadow.

Now, this can be changed and will be changed throughout the EVAs because it is time exposure. Some of the exposures are short. Some will be entire time they are inside the LM, for example, to get real good information on the ultraviolet.

There is a battery on this and I will show you a picture of how that is located on the surface.

Next viewgraph, please.

(Slide.) (3)

Now, that covers pretty much the real quick run-through of the surface experiments. Now let me turn to the orbital science plan.

Here again is an Apollo 15. We have repeat many of the experiments which were flown for the first time on Apollo 15.

One of the early philosophies in NASA was that we would try to fly these experiments at least twice. This was to verify the information they gather and, of course, if one mission failed we would at least get one crack with some of these experiments.

The gamma ray, the X ray and the alpha particle are essentially the same. You recall we did have some anomalies during the mission. We have tried to make some improvements to insure that these don't come up.

The S-band transponder is one we have flown on three missions and a mass spectrometer which is on the boom.

You will recall there was some talk about deploying the booms, whether they were deployed or not, and if we get stuck with a boom out and we are coming up to an SPS burn, we are going to jettison the boom, just get rid of the experiment because we don't want to take the chance of damaging the SPS engine in case we have to fire the engine,

LUNAR ORBITAL SCIENCE PLAN

	EXPERIMENT	11	12	14	15	16
SERVICE MODULE:						
S-160	GAMMA-RAY SPECTROMETER				X	X
S-161	X-RAY FLUORESCENCE				X	X
S-162	ALPHA-PARTICLE SPECTROMETER				X	X
S-164	S-BAND TRANSPONDER (CSM/LM)			X	X	X
S-165	MASS SPECTROMETER				X	X
	SM PHOTOGRAPHIC TASKS					
	24" PANORAMIC CAMERA				X	X
	3" MAPPING CAMERA				X	X
	LASER ALTIMETER				X	X
	SUBSATELLITE:					
S-173	PARTICLE MEASUREMENT				X	X
S-174	MAGNETOMETER				X	X
S-164	S-BAND TRANSPONDER				X	X
COMMAND MODULE:						
	CM PHOTOGRAPHIC TASKS	X	X	X	X	X
S-170	BISTATIC RADAR			X	X	X
S-177	UV PHOTO EARTH AND MOON				X	X
S-178	GEGENSCHEIN			X	X	X
M-078	BONE MINERAL MEASUREMENT			X	X	X
M-191	MICROBIAL RESPONSE IN SPACE ENVIRONMENT					X
M-211	BIOSTACK					X

which is scheduled, of course. But if the boom is stuck out, why we would really jettison it.

Well, this time we have put a microswitch to tell us a little more accurately whether that boom has come in or not. We won't be in the blind as we were before. You had to get a talk-back. But this time we have got a microswitch which will be activated when it gets within twelve inches and if it is in that far we feel safe, go ahead and fire the SPS engine.

Now, as far as the photographic task goes, we did have some problems with the mapping camera and the laser altimeter. We hope we have resolved most of these. And we did get some very fine photos from the 24-inch pan camera and the 3-inch mapping camera.

I will show you later that we will be covering some new area and we also will be duplicating some area that we covered in 15.

Now, there is an advantage to duplicating some of the area because we get it at different sun angles and this is very good to help us in photo interpretation.

The subsatellite will be flown again essentially the same as we had on Apollo 15. As many of you are aware we have had a failure in the instrumentation data circuits of the subsatellite now orbiting the moon. We think we know what has caused this problem. We think it is a random failure and we have not been in the position to go in nor have we felt we really knew what we wanted to do to change anything. So we are flying essentially the same thing on this mission.

Now, we did get six months at least of good data on the subsatellite and, although we have lost the magnetometer and the particle measurement, we are still getting data from the S-band transponder, the mascons and so forth around the orbit. We still are getting that good data.

QUESTION: Will you be able to unscramble that data that you are still getting?

LEE: Very difficult. I don't think we have too much hope. Let me ask Floyd or --

VOICE: We get no more data from the magnetometer and about 10 percent of the data from the particle measurement.

LEE: It was 90 and 50 percent and with the latest failure, which was the second failure we believe in the same I-C circuit, just a progressive failure, we are down to, as Floyd said, 10 percent in one and nothing in the other. Except the S-band transponder is working.

Now, as far as the command module, the photographic tasks, targets of opportunity and such as Al Warden did, will be continued again. They have been briefed on this and are being continuously briefed on what they might want to get here.

The biostatic radar and the photo -- ultraviolet photo of earth and moon will be done again. Gegenschein and bone mineral.

Now, we do have two new ones. Let me just touch quickly on those. They are medical experiments.

Next viewgraph, please.

(Slide.) (not included herewith)

On the right you see the microbial response in space environment. I believe that is called MEED, an anacronym. And you see it here mounted where the TV will be mounted for the EVA that Ken Mattingly will do to retrieve the films.

The idea here -- and there are a number of small cubes with, let's see, fungus and seeds and -- Alex, what else do we have?

VOICE: Viruses, bacteria and fungus.

LEE: Viruses, bacteria and fungus are carried in small cubes. None of them are harmful to man. And underneath -- there is a layer here with a number of them and a layer here and then underneath is another layer that has the same fungus, bacteria and so forth we use as a control box because they will not be exposed.

What we are going to do here is after Ken retrieves the film he will enter -- reenter the spacecraft. We will change the attitude so that this is pointed directly at the sun so that he gets the direct rays of the sunlight to see the effect on these. And it will be exposed for about ten minutes and brought back into the command module and returned to earth.

QUESTION: Chet, will that be televised, that experiment?

LEE: No. The television will come down. The television is mounted on the same staff here that the MEED is going to be mounted.

What we will have is we will have the TV mounted for Ken's EVA and Charlie Duke, of course, will be standing in the hatch with a teather line and -- do you say I have one here?

VOICE: Yes.

LEE: I do have some of these up here that you can look at. This is the staff, the rod that it is mounted on and you can see how it is mounted here. And this plugs in right into the hatch of the command module.

QUESTION: There is no chance of their hand-holding the camera?

LEE: No.

QUESTION: Am I right in thinking you will rotate the spacecraft it necessary with the hatch open?

LEE: That is correct. The present plan is to -- and I will show you a timeline a little later on it. Ken will get back into the command module. It is not a large change and it will be a very slow change. And he is teathered and we will rotate to get the sun. It is about 20 degrees, I think, in roll and 9 degrees in pitch and I have forgotten what it is in yaw.

QUESTION: Chet, what was that acronym you used and what it is an anacronym for? What is it the initials of?

LEE: MEED?

QUESTION: MEED.

LEE: Microbial -- that doesn't add up.

(Laughter.)

LEE: Alex, can you help me on that?

VOICE: Yes. It is Microbial Ecology Evaluation Device. There are three trays. Actually the trays have that title and the trays are containers for the cubits and various filters so you produce different exposure conditions.

QUESTION: What is the point of that, Chet?

LEE: Well, the -- I guess there is some interest in just what we -- in Skylab we are going to have some EVAs and some of these bacteria, fungus are on the suit before they go out. They will be exposed for about this period of time during Skylab. So the idea is to find out is there anything when we bring those suits back in and stow them for long periods of time like we are going to have on Skylab, do we have anything that we should be considering or concerned about as far as mutants and so forth in these bacteria and so forth.

I think that's correct. Is that right?

VOICE: That is part of it. It sure is.

VOICE: Chet, will anyone be standing in the hatch or outside during any part of this experiment or will they all be inside?

LEE: They will be inside during the experiment. Ken will get out of the hatch, move down the EVA, retrieve the film, come back in, take the television camera off, put this on, and then get back in.

QUESTION: How do they retrieve that? Do they close the door and then go out?

LEE: Oh, no, you can reach right up and pull it off the hatch and then close the hatch.

ATCHISON: How about holding your question unless there is something you don't understand on a slide or something in conflict. Hold your questions until the end so that we can get a mike to you and other people can hear your questions.

All right?

LEE: I guess I blew that one. I asked for them. But if I am not getting into the detail, why please interrupt me and we will get a mike to you.

Next experiment, please.

(Slide.) (not included herewith)

Now, this is the biostack and here is a picture of it and we have one here. This is purely passive. It will stowed taken on, never -- the crew does not have to take it out and return it to earth.

This is the size of it and you are welcome to look at it when we finish.

This, again, has several layers, bacteria, seeds, and this drawing is incorrect. There are not several layers of seeds but one layer, just one row so to speak. And radiation dosemeters. Eggs. I think those are shrimp eggs. And these will be exposed to and from the moon, of course, and returned to the principal investigator who will then open up and make his analysis of what has occurred.

QUESTION: What kinds of seeds are they, Captain?

LEE: That is a viewgraph. Let's put that up -- back up viewgraph here a moment.

(Slide.) (not included herewith)

VOICE: They are bacterial spores, watercress, embryos and brine shrimp eggs. There are four different layers.

LEE: We can give you a copy of this. I don't believe we have this in our regular --

QUESTION: How and where is it exposed?

LEE: It is stowed in the command module in a spot and they haven't decided exactly where it is and that is it, just it will get hit with the heavy particles of cosmic radiation no matter where it is stowed. And it is left there and it is returned. It is stowed and not touched until it gets back and is removed from the command module.

QUESTION: They are exposed to the same flux of cosmic rays, then, that the men are when inside the craft?

LEE: That is correct.

Next viewgraph.

(Slide.) (not included herewith)

Another experiment we will have on this. Wehave done forms of it before. All of you have heard about the high-Z particles enclosing and having the crews cover their eyes and count the particles by light flashes that they see. And this is a step to get the directions and get a little more data to correlate with what we have already gotten from just pure counts that are recorded and then transmitted during the flight.

This is the -- what is the name of it -- the ALFMED that will be carried and will be worn by Ken Mattingly on the way to the moon. For an hour. And I will go into that in a little more detail later.

This now has moving plates. Takes about an hour. It it battery power controlled. And once he turns it on these plates move very slowly and they will record as they cross, of course, the angle and everything that these high-Z particles create.

And he has on sides and the front.

Now, at the same time that he is doing that the other two crew members on the way out will wear patches over their eyes and go through the same count that we did on the previous missions.

Now, this will not be worn on the way back. And these are pathces that they wear over their eyes. This will be done only on the way to the moon. The alfmed (?) will be worn. And on the return flight then they will just wear the patch. The ALFMED will not be used again. These will be returned to the principal investigator for analysis of the plates that are enclosed in the instrument itself.

Another experiment that we have carried on previous missions is the electrophoretic separation demonstration. You will recall Stu Russo worked this one on TV for us. We did have some problems on that one. We have no organic materials in this one. We feel we will get the same data.

Could I have the next viewgraph please.

QUESTION: Before he puts that up, Chet, could I ask you one other question about this? Could you put the other one back?

(Slide.) (not included herewith)

The plates that you say move up, are they sensitized plates or --

LEE: Yes.

QUESTION: So he is not necessarily going to see the same flashes that the other guys see if they come in a shower?

LEE: That's correct.

QUESTION: But the tracks will be registered on the photographic plates?

LEE: That's correct.

(Slide.)

Okay. This is a picture of the electrophoretic experiment -- demonstration, rather, that we are carrying.

We have made some improvements in time and we have enlarged the viewing area here and we are going to have a regular -- one of the things we weren't too happy with was the photograph of the processes as they occurred because you have to be very accurate on the distance.

We have now got a very accurate device which is sort of mounted on the camera so we have the exact distance.

We still have to worry about the focus, but we are sure we can handle it. And I think the key thing is we are not carrying organic materials like we did the last time but we feel we will get the same information as to how well we can do this purification, getting the real pure vaccines, so to speak. And if this is practical to investigate further in Skylab and for future use to get greater quantities of this very, very pure vaccine compared to what we can do here in the labs.

This will be returned to Marshall upon return, upon return, completion of the mission.

Next viewgraph, please.

(Slide.) (4) (5)

Now on to the operational aspects of the mission. I have listed here primarily the differences. You will note the launch azimuth on Apollo 15 was 80 to 100 degrees. On this mission, because the SPS margins aren't quite the same, we can take advantage of the full. We were doing that on 15 to get a payload advantage. We are not facing the exact same situation here so we can use the complete window here on Apollo 16.

Now, note that April 16 is the one day in April that we can launch. The launch time is 12:54 Eastern Standard Time with the window closing around 4:43.

The sun angle at landing is 11.9 degrees.

If we don't go in April then, of course, we will look to May and we will have three opportunities currently set up for May. That is a T minus 24. As you recall, we have described that in the past where we would, in order to get a satisfactory sun angle, we would launch 24 hours in advance of the nominal time and that would mean we would spend 24 additional hours in lunar orbit before we make the landing so we have the right sun angle.

T-0 is May the 15th and so on.

Now, June the 15th we are still investigating, if

APOLLO 16 vs APOLLO 15
OPERATIONAL DIFFERENCES

ITEM	APOLLO 16	APOLLO 15
LAUNCH AZIMUTH	72 - 100°	80 - 100°
INCLINATION	9°	26°
DOI TRIM MANEUVER	NOT PLANNED	ACCOMPLISHED
HIGH ALTITUDE LANDMARK TRACKING AND TV OF LANDING SITE	NO	YES
PDI	REV 13	REV 14
SURFACE STAY TIME	~73 HOURS	66.9 HOURS
SURFACE REST CYCLE	8 HOURS (REST BEFORE LIFTOFF)	7 - 7 1/2 HOURS (NO REST BEFORE LIFTOFF)
EVA's: DURATION (HRS) (PLANNED)	7 - 7 - 7	7 - 7 - 6
SEVA	NO	YES
TRAVERSE STATION TIMES	9:40 (PLANNED)	7:53 (PLANNED) 5:00 (ACTUAL)
SURFACE ACTIVITIES	ALSEP DEPLOYED FIRST	TRAVERSE FIRST
LUNAR ORBIT PLANE CHANGES	2	1
EARTH RETURN INCLINATION	62°	40°
LANDING	PLAN TO RECOVER PARACHUTES AND RETAIN RCS PROPELLANTS ON BOARD	NEITHER APOLLO 16 TYPE EVENTS WERE PLANNED

APOLLO 16

LAUNCH WINDOWS*

LAUNCH DATE	LAUNCH OPPORTUNITIES	OPEN (72°)	CLOSE (100°)	SUN ELEVATION ANGLE
APRIL 16, 1972	T-0	1254	1643	11.9°
MAY 14, 1972	T-24	1217	1601	6.8°
MAY 15, 1972	T-0	1230	1609	6.8°
MAY 16, 1972	T+24	1238	1613	18.6°
JUNE 13, 1972**	T-24	1050	1423	13.0°
JUNE 14, 1972**	T-0	1057	1426	13.0°
JUNE 15, 1972**	T+24	TBD	TBD	TBD

* APRIL 16 TIME IS EST, ALL OTHER TIMES ARE EDT.

** JUNE TIMES ARE APPROXIMATE AND FOR PLANNING PURPOSES ONLY. ACCEPTABILITY OF THE JUNE 15 LAUNCH DATE IS UNDER REVIEW.

we should have to go to the third month, whether we -- we are still investigating the T plus 24 capability on that particular day because of the sun angle and the sun azimuth.

The only other thing I want to point out here is please not that we shift to daylight saving time so that in May and June we are talking Eastern Daylight Time instead of Eastern Standard Time.

Now, to get back to the --

QUESTION: Pardon me. Why can't you go T minus 24 in April as well as May to give yourself two opportunities to get off?

LEE: T minus 24?

QUESTION: Yes. Why couldn't you go on April 15th and spend an extra day?

LEE: We could have, Bill, and we looked at it very seriously. But the chances are, with -- so far we have been fortunate. We have gotten off on time -- we would, in the first month opportunity, we would probably -- we would have a high probability of committing ourselves to flying a T minus 24 which means 24 hours more on lunar orbit without accomplishing the primary purpose, which is to land.

On the inclination, that has merely to do with the latitude of the landing site and, as you can see, we are landing a little north latitude but south of where we did on the Hadley Rille, 26 degrees north latitude.

Now, in the DOI trim maneuver we did plan one on Apollo 15 because of the high inclination orbit. We knew we were going to go over a lot of mascons. We weren't quite sure of the effect and when we go into DOI we felt that after a number of revs in that low orbit we would probably have to adjust, of course, because we don't want to get down too close clipping the mountain tops.

Now, we are not planning it on the DOI trim and I think I had better have the next viewgraph here while I am talking to this.

(Slide.) (6) (7) (8)

We are not planning it on Apollo 16 for several reasons. One, we are flying over areas that are not, like on Apollo 15, as many mascons. We think we understand it better. We learned a lot from Apollo 15. So we should be able to place ourselves in this approximately 60 by 10 mile nautical orbit so that we don't have to adjust during that period of time. So we are not planning on doing it.

However, if we should find we have to do it, we will wake the crew up early and do a DOI trim.

Now, why did we consider this? I think if you will follow this, most of this you have seen before, the lift-off, the translunar injection, a transposition in docking, they are all the same.

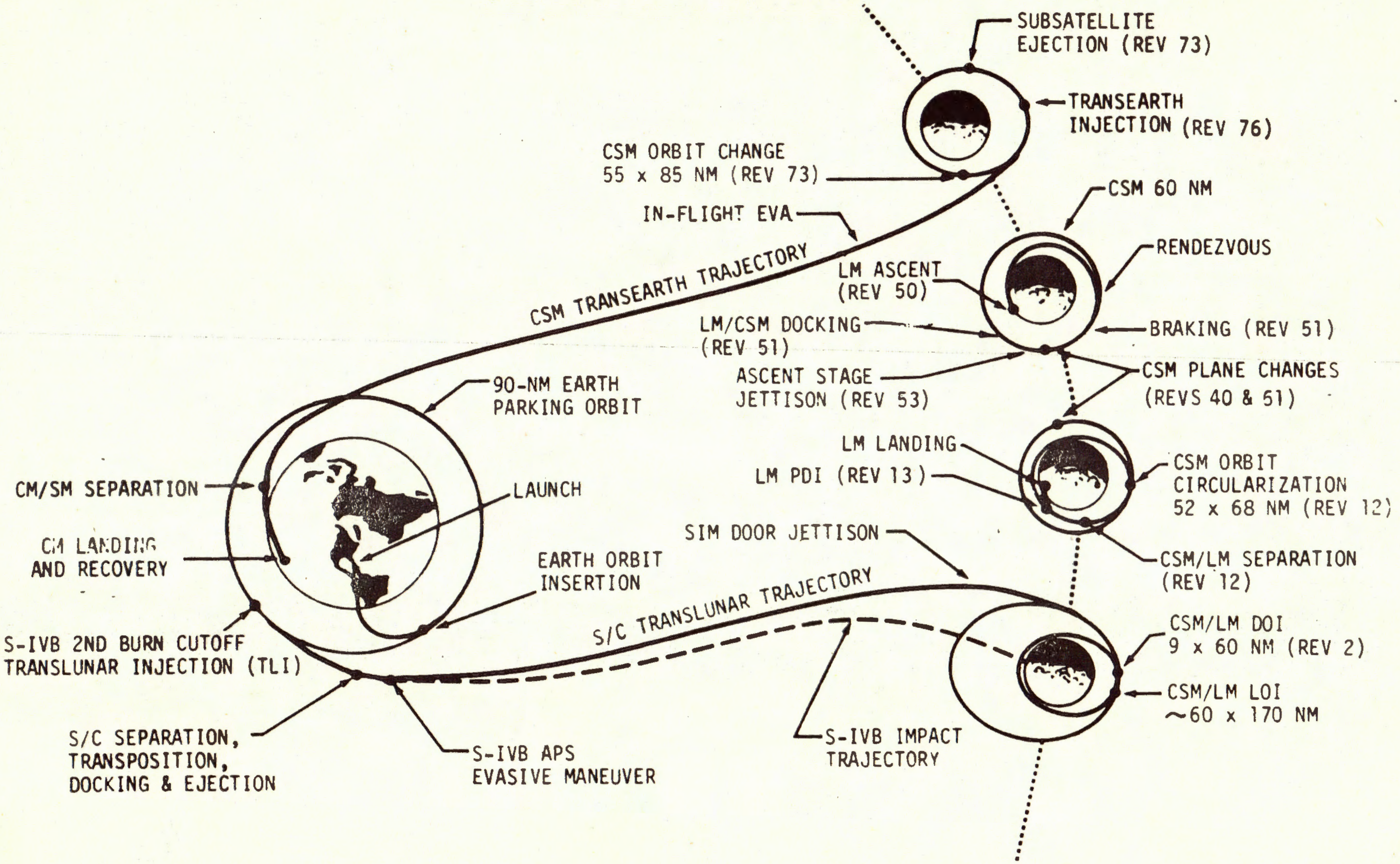
The S-IVB, the basic maneuver, and then driving at

APOLLO 16
SEQUENCE OF MAJOR EVENTS*

EVENT	GET HR:MIN	DATE/TIME MO/DAY, EST	BURN DURATION ~SEC.(SYSTEM)	ΔV, FPS	REMARKS
LAUNCH	00:00	4/16, 12:54 PM			PAD 39A, 7,610,000 LB. THRUST
EARTH PARKING ORBIT INSERTION	00:12	1:06 PM	713.9 (SAT V)	25,604	90-NM CIRCULAR ORBIT
TRANSLUNAR INJECTION (TLI)	02:34	3:28 PM	334.9 (S-IVB)	9,951	PACIFIC INJECTION
CSM/LM EJECTION	03:59	4:53 PM	3 (SM RCS)	1.1	SPRING EJECTION FROM S-IVB/IU
S-IVB EVASIVE MANEUVER	04:22	5:16 PM	(S-IVB APS)	9.8	LOX DUMP 21-MIN. LATER
MIDCOURSE CORRECTION (AS REQ'D)					APPROX. 72-HR. TRANSLUNAR COAST
SIM BAY DOOR JETTISON	69:59	4/19, 10:53 PM			PYROTECHNIC SEPARATION
LUNAR ORBIT INSERTION (LOI)	74:29	3:23 PM	375 (SPS)	2,807	60 X 170-NM ORBIT
S-IVB/IU PREDICTED LUNAR IMPACT	74:30	3:24 PM			2.3°S., 31.7°W.
DESCENT ORBIT INSERTION (DOI)	78:36	7:30 PM	24.1 (SPS)	206	9 x 60-NM ORBIT (REV.2)
CSM/LM UNDOCKING & SEPARATION	96:14	4/20, 1:08 PM	(SM RCS)	1	SOFT UNDOCKING (REV. 12)
CSM ORBIT CIRCULARIZATION	97:42	2:36 PM	5.9 (SPS)	99.6	52 X 68-NM ORBIT
POWERED DESCENT INITIATION (PDI)	98:35	3:29 PM	721.5 (DPS)	6,696	REV. 13, 53,000 FT.
LM LANDING, DESCARTES	98:47	3:41 PM			SEA = 11.9° (9°'S., 15°31'E.)
EVA-1 (7-HR. MAX.)	102:25	7:19 PM			DEPLOY ALSEP, LRV TRAVERSE
EVA-2 (7-HR. MAX.)	124:50	4/21, 5:44 PM			LRV TRAVERSE, STONE MOUNTAIN
EVA-3 (7-HR. MAX.)	148:25	4/22, 5:19 PM			LRV TRAVERSE, N. RAY CRATER
LUNAR ORBIT PLANE-CHANGE NO. 1	152:29	9:23 PM	9.1 (SPS)	158.7	REV. 40
LM LIFTOFF	171:45	4/23, 4:39 PM	434.3 (APS)	6,048	REV. 50, TV MONITORED
TERMINAL PHASE INITIATION (TPI)	172:39	5:33 PM	2.5 (APS)	50.3	FROM 9 X 46-NM INSERTION ORBIT
BRAKING (TPF)	173:20	6:14 PM	30.2 (LM RCS)	33.4	LM ACTIVE RENDEZVOUS
CSM/LM DOCKING	173:50	6:44 PM			REV. 51
CSM/LM SEPARATION	177:36	10:30 PM	13.2 (SM RCS)	2	ORBITAL SCIENCE IN 60-NM ORBIT
LM DEORBIT (IMPACT)	179:39	4/24, 0:33 AM	95.5 (LM RCS)	229.6	LM IMPACT 23 MIN. LATER
LUNAR ORBIT PLANE-CHANGE NO. 2	193:14	2:08 PM	15.8 (SPS)	282.5	REV. 61
CSM ORBIT CHANGE	216:49	4/25, 1:43 PM	2.2 (SPS)	38	55 x 85-NM ORBIT, REV. 73
SUBSATELLITE EJECTION	218:02	2:56 PM			APPROX. 1 YR. IN ORBIT
TRANSEARTH INJECTION (TEI)	222:21	7:15 PM	150.5 (SPS)	3,212	68-HR. TRANSEARTH COAST
IN-FLIGHT EVA	242:00	4/26, 2:54 PM			RETRIEVE FILM CASSETTES
MIDCOURSE CORRECTIONS (AS REQ'D)					SCIENCE & PHOTO TASKS
ENTRY INTERFACE	290:23	4/28, 3:17 PM	(CM RCS)		VELOCITY ~ 36,000 FPS
LANDING	290:36	3:30 PM			5°N., 158°40'W.

* DATA BASED ON FIRST LAUNCH & TLI OPPORTUNITIES

APOLLO 16
FLIGHT PROFILE


SUBSATELLITE EJECTION (REV 73)
TRANSEARTH INJECTION (REV 76)
CSM ORBIT CHANGE 55 x 85 NM (REV 73)
IN-FLIGHT EVA
CSM 60 NM
RENDEZVOUS
CSM TRANSEARTH TRAJECTORY
LM ASCENT (REV 50)
LM/CSM DOCKING (REV 51)
BRAKING (REV 51)
ASCENT STAGE JETTISON (REV 53)
CSM PLANE CHANGES (REVS 40 & 51)
90-NM EARTH PARKING ORBIT
LM LANDING
LM PDI (REV 13)
CSM ORBIT CIRCULARIZATION 52 x 68 NM (REV 12)
CM/SM SEPARATION
LAUNCH
CM LANDING AND RECOVERY
SIM DOOR JETTISON
CSM/LM SEPARATION (REV 12)
EARTH ORBIT INSERTION
S/C TRANSLUNAR TRAJECTORY
CSM/LM DOI 9 x 60 NM (REV 2)
S-IVB 2ND BURN CUTOFF TRANSLUNAR INJECTION (TLI)
CSM/LM LOI ~60 x 170 NM
S/C SEPARATION, TRANSPOSITION, DOCKING & EJECTION
S-IVB APS EVASIVE MANEUVER
S-IVB IMPACT TRAJECTORY

4174

APOLLO 16 vs APOLLO 15
OPERATIONAL DIFFERENCES

ITEM	APOLLO 16	APOLLO 15
LAUNCH AZIMUTH	72 - 100°	80 - 100°
INCLINATION	9°	26°
DOI TRIM MANEUVER	NOT PLANNED	ACCOMPLISHED
HIGH ALTITUDE LANDMARK TRACKING AND TV OF LANDING SITE	NO	YES
PDI	REV 13	REV 14
SURFACE STAY TIME	~73 HOURS	66.9 HOURS
SURFACE REST CYCLE	8 HOURS (REST BEFORE LIFTOFF)	7 - 7 1/2 HOURS (NO REST BEFORE LIFTOFF)
EVA's: DURATION (HRS) (PLANNED)	7 - 7 - 7	7 - 7 - 6
SEVA	NO	YES
TRAVERSE STATION TIMES	9:40 (PLANNED)	7:53 (PLANNED) 5:00 (ACTUAL)
SURFACE ACTIVITIES	ALSEP DEPLOYED FIRST	TRAVERSE FIRST
LUNAR ORBIT PLANE CHANGES	2	1
EARTH RETURN INCLINATION	62°	40°
LANDING	PLAN TO RECOVER PARACHUTES AND RETAIN RCS PROPELLANTS ON BOARD	NEITHER APOLLO 16 TYPE EVENTS WERE PLANNED

the impact of the moon are pretty much the same and lunar orbit insertion is the same as we have done in the past.

We have gone into a 60 by 170 nautical mile and then do a DOI trim where it is down to 9 by 60. And those figures are not exactly correct, they are approximate.

Now, you will note that we do come up to the differences. The LM PDI will be done on rev 13 instead of 14. So that is one of the things I want to bring out, that we are able to land on rev 13 because we have elinimated the PDI trim as an event that takes time of the crew and we are also eliminating necessity of high altitude landmark tracking.

Now, we needed it on Apollo 15 because we hadn't tracked that area. But we have tracked this area and we are quite confident that we know the navigation to the degree that we need for a safe landing.

Furthermore, we -- this area is somewhat more forgiving, and maybe that is not the best word, but it is more forgiving than Hadley Apennine. If you don't land right at the target you have lots of room in the Descartes area as long as you pick out a good spot and land.

You are not faced with a rille in front of you and a mountain on the left of you and one right in back of you. So it is more forgiving. So we can do without the high altitude landmark tracking and we can do without the PDI. So we feel now we can land on rev 13.

What is the purpose of landing on rev 13? On this mission the crew is going to do an EVA -- no standup EVA, which I will point out, and they are going to do an EVA before they sleep.

Now, this is purely crew preference. This is the way they feel they can best do their job. They feel they couldn't sleep maybe like Dave and Jim did so they want to get out. And we don't want them to have t o long a day. So we said how can we reduce the day and this is one way we are doing it.

We haven't made it mandatory but all our planning goes to making sure that from the time they get up -- which I will show you in a time line here very shortly -- until they repress the cabin after the first EVA is not longer than 18 hours.

Now, it is not mandatory, but we are sure going to try to stick with that just to make sure the crew is rested.

So that is one difference. We are going to try to land on rev 13. Of course, if we can't land on rev 13 then we will land on 14 or 15 if necessary.

The effect of this is to effect the length of our EVAs.

The PDI. I have pointed out the surface stay time is now new. We are going to be 73 hours on the surface versus 66.9 in Apollo 15.

Now, we are just taking more time. And let me point out that that is six hours additional time on the lunar surface. One hour is going into the EVAs as you will see here on duration. We are planning 7, 7, 7 instead of 7, 7, 6. The remaining five hours do not go to anything specific. They are in there to give the crew a more relaxed period of time during their prep and post-EVA sessions.

If you look back on 15 they are always pushing and what we are trying to do here is say hey, you have got more time, you don't have to push. We were insisting that they get eight hours of sleep. I am sure Chuck Berry is going to say they don't sleep eight hours, probably, but I am sure he is going to insist that they lie down and rest for eight hours if they can't sleep.

And we are not going to push them. They are going to have more time for all these evolutions that occur from the time they get up until they egress and when they get back in and put all the stuff away and get ready for bed again.

As I pointed out earlier, there is no stand-up EVA on this mission as on Apollo 15.

With regard to the traverse stations times, we are planning -- this is time on station at the various geological sites and so forth. This mission, as you will see a little later, plans for nine hours and forty minutes total time on station during geological work and experiments work. That does not count the ALSEP now. This is strictly on the traverses.

This is compared to what we had planned on Apollo 15 with seven hours and fifty-theree minutes.

I am sorry. This isn't working all the time.

Seven hours and fifty-three minutes was planned whereas we actually only got five hours, as you recall. Dave was using more oxygen on first EVA. We cut it slightly short and then, because we ran over in time on these preparations and post -- preparations before and after EVA, we cut the third EVA short. So we didn't get as much as we had planned.

Now, with regard to the surface activities you will recall on Apollo 15 the first thing we did was get to the front and then we came back and deployed the ALSEP. On this mission, because the Cayley sample is the first priority, along with the front -- they are equal, so to speak -- we can go out and deploy the ALSEP, move out a little further and get the Caley samples. I will show you on a traverse here. So that we are not compromising anything. And we can do this on the first EVA.

On lunar orbit plane changes on Apollo 15 we only had one and that was primarily for getting the command module into position for rendevouz with the LM for liftoff. On Apollo 16, provided we confirm in real time that our SPS margins are adequate, we are going to make a plane change to give us a few more degrees of new lunar surface to cover with our orbital experiments. And I will show you that in a few minutes.

The earth return inclination is nominally 62 degrees on this mission whereas on Apollo 15 it was 40. That means they come in a more north and south direction. And I will show you a picture of the landing area in a few minutes.

The landing. We are going to land with the RCS propellants on board this time. You will recall since Apollo 7 we did land with the RCS propellants aboard. After Apollo 7 the decision was made to dump or burn the RCS propellants after the chutes deploy.

Based on what we have learned from Apollo 15, our analysis of the chute problem, unless we see we are landing on land for some reason, we are going to burn -- not burn the RCS propellants. We have checked the clearances and we have made some tests and we are satisfied that there is no problem with landing with RCS propellants aboard.

Now, we are also getting out information and made sure that the recovery forces and swimmers are well aware of this because you do have these RCS propellants that you have to worry about after landing and we are making sure that procedures are set up for them so that they recognize it also and when they get aboard the aircraft carrier how they remove the propellants from the spacecraft.

Next viewgraph, please.

(Slide.)

Now, with regard to the timeline as we approach the moon, we will do our SIM door jettison just as we did on Apollo 15, about four and a half hours before we go into lunar orbit to do the lunar orbit insertion burn.

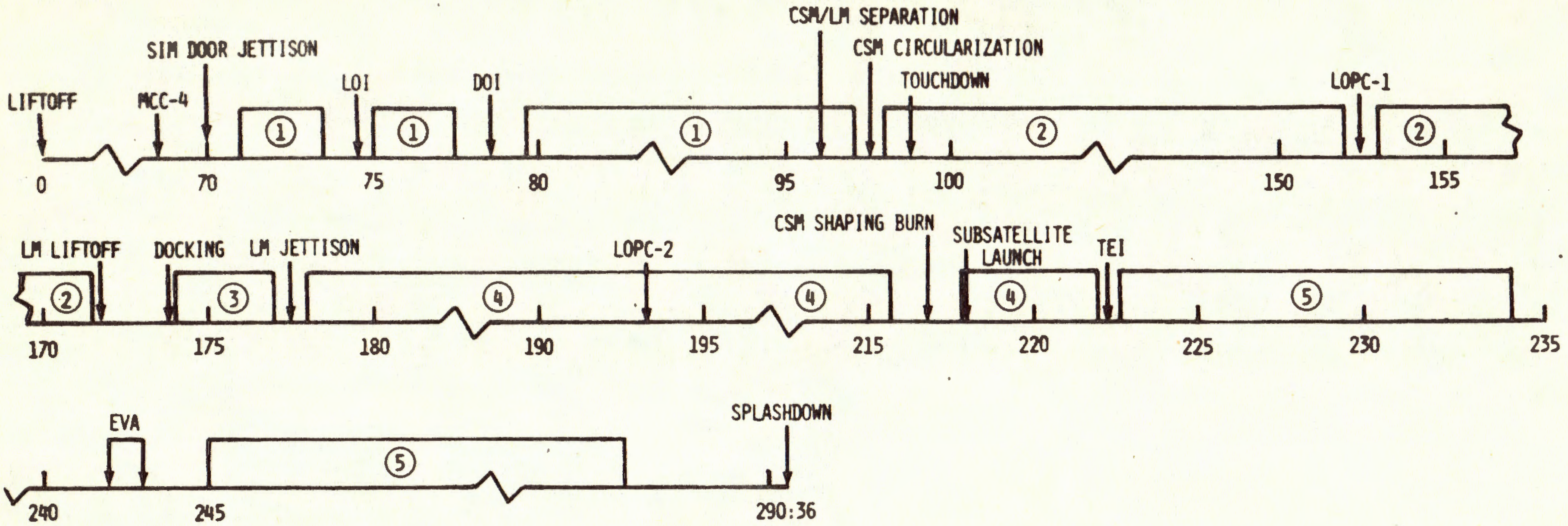
The difference here is that we will not wear suits on Apollo 16 for this event. You recall we did wear suits on Apollo 15 because we had never done a SIM door jettison. We have looked at all the data. We talked to the crew. They said they could hardly feel it. And some of the other pyros are worse that they don't wear suits and there is no danger. So we feel that there is no need for them to take the extra time to exert themselves just before going into lunar orbit to be putting the suits on and taking them off. So we are going in without suits on the SIM door jettison.

The numbers in the blocks that you see relate to the lower part here where we try to give you an idea of the time spent in the configuration, what hours each of the experiments are getting.

Now, I have goine through the LOI. The LOI is quite similar to what we have done in the past. I have got it up here. Your approach hyperbola and then you have the burn is only 375 seconds.

The interesting thing on this one is that in the past the command module or, rather, the spacecraft LM and

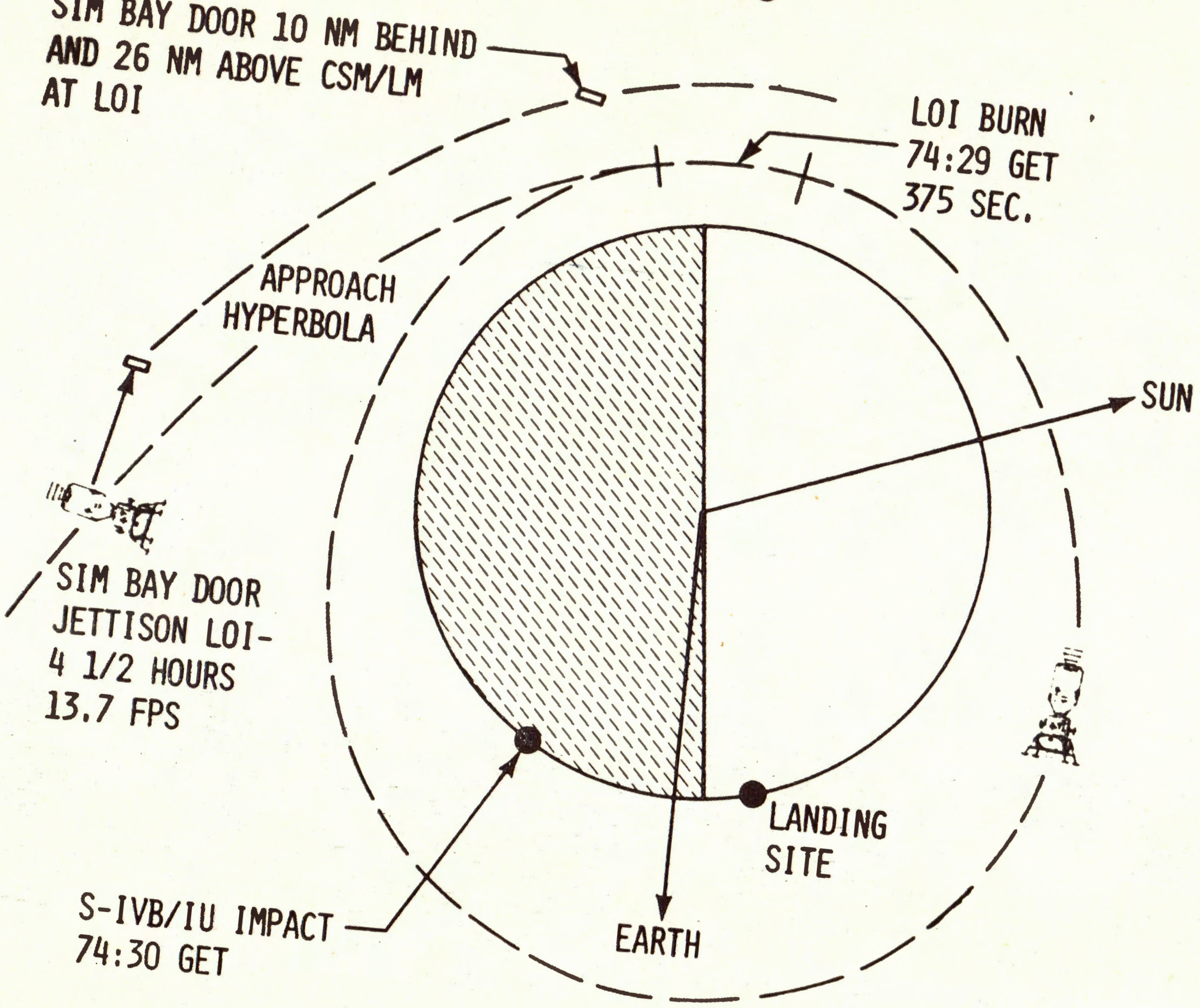
APOLLO 16 ORBITAL TIMELINE



SIM OPERATION PERIODS (NON-CONTINUOUS)

ACTIVITY PERIOD	CONFIGURATION	γ-RAY SPEC	α-PARTICLE SPEC	X-RAY SPEC	MASS SPEC	MAP CAMERA	PAN CAMERA	LASER ALTIMETER
①	CSM-LM							
②	CSM							
③	CSM-LM							
④	CSM							
⑤	CSM							
TOTAL TIME (HOURS:MINS IN LUNAR ORBIT)		140:15	140:15	110:53	110:28	19:24	2:44	19:46

APOLLO 16


SIM BAY DOOR 10 NM BEHIND
AND 26 NM ABOVE CSM/LM
AT LOI
LOI BURN
74:29 GET
375 SEC.
APPROACH
HYPERBOLA
SUN
SIM BAY DOOR
JETTISON LOI-
4 1/2 HOURS
13.7 FPS
LANDING
SITE
S-IVB/IU IMPACT
74:30 GET
EARTH

command service module have been about in this posture orbiting the moon. In other words, LOI has ocucrred about the time that the S-IVB impacts the moon. This time the S-IVB, if everything goes as we planned, should be impacting just about the time they are doing the LOI burn.

Next viewgraph, please.

(Slide.)

Here I have tried to show you the Apollo 12 and 14 seismographs, Apollo 15. The blue are the previous S-IVB impacts and the target for Apollo 16 is this spot right here (indicating). It is about 433 kilometers from the Apollo 14 site and it is, as you can see on this scale here, 1347 kilometers from Apollo 15 up to the top of the chart.

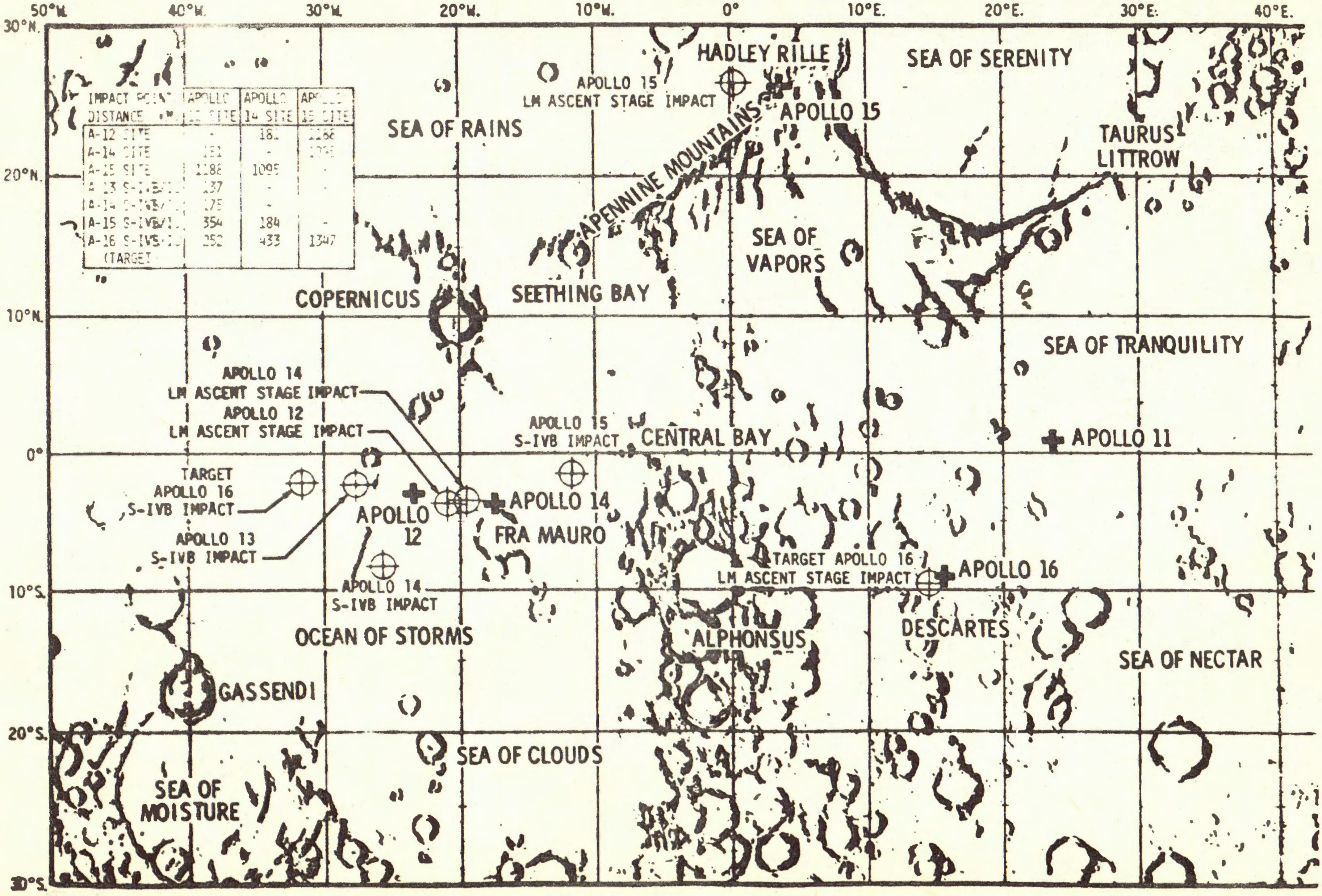
Next viewgraph, please.

(Slide.) (not included herewith)

I did discuss the DOI to some degree and a separation, but I will just point out here again that DOI will occur on the second rev after lunar orbit insertion. It is a short burn, 24.1 seconds. It will be done with the SPS engine to save our LM fuel.

In blue you will see on the twelfth rev we do have separation. The command module does a circularization burn that we have done in the past and the LM separates, continues around, and then on rev 13 we will commence PDI, landing at Descartes.

S-IVB/IU IMPACT



IMPACT POINT DISTANCE	APOLLO 12 SITE	APOLLO 14 SITE	APOLLO 15 SITE
A-12 SITE	-	181	1188
A-14 SITE	181	-	1095
A-15 SITE	1188	1095	-
A-13 S-IVB/IU	137	-	-
A-14 S-IVB/IU	175	-	
A-15 S-IVB/IU	354	184	-
A-16 S-IVB/IU (TARGET)	252	433	1347

Next viewgraph, please.

(Slide.)

Now, very quickly on the power descent stage, on the left here I have tried to give you a plan view of the terrain that they are flying over along with a chart showing you how it compares to the tops of the mountains.

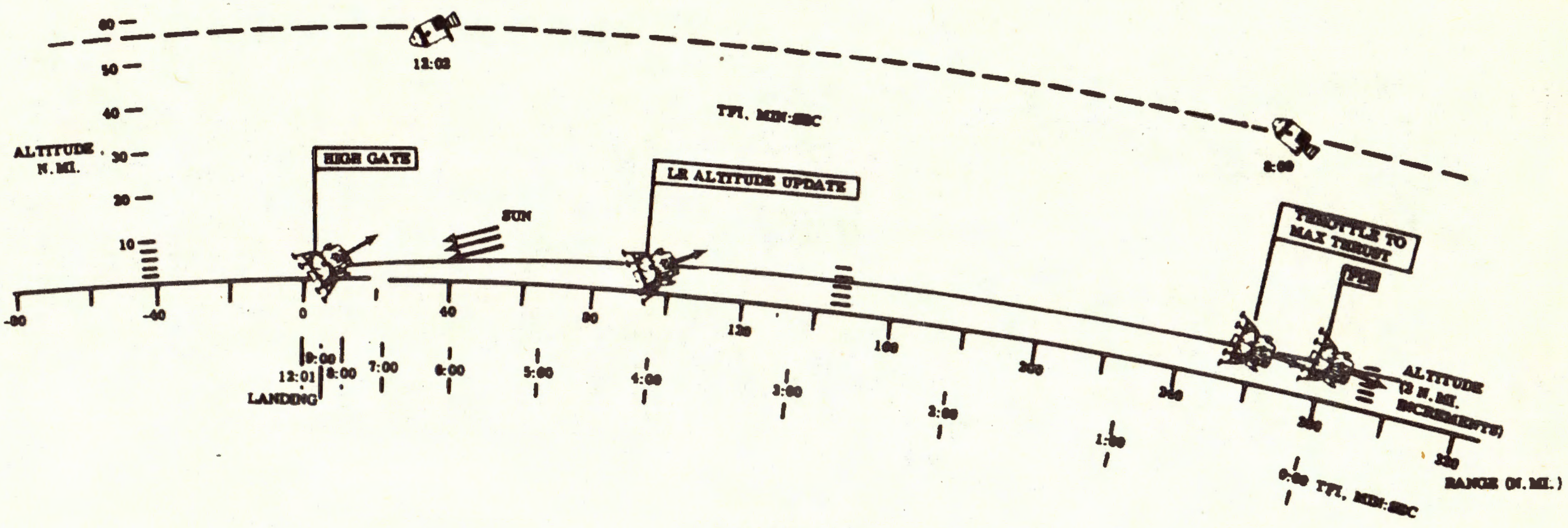
Let me point out that this is a four-to-one vertical exaggeration, so the Kant Plateau, although it is relatively high, we are coming in at a real good elevation above the area and if we didn't make a four-to-one exaggeration that would look almost like a flat line. And this is somewhat different than you recall we had on Apollo 15 where we had some pretty high mountains we came in over.

Although we are up high we are not coming in those steep mountains.

And shown here, this is well after PDI is commenced but it shows you are coming in over Kant Plateau and your dips throttle recovery occurs about here and then high gate and then the landing phase, and I will go into more detail on these.

On the right-hand chart -- you have seen this one before. I think the data is here and it isn't necessary for me to go into all the detail of your various positions except to point out PDI and then throttle to maximum thrust you will see this 26 seconds after we start. We are still making 5527

POWERED DESCENT VEHICLE POSITIONS



SUMMARY

EVENT	TFI MIN:SEC	V_I ,FPS	$\dot{H}$ FPS	H FT	ΔV FPS
POWERED DESCENT INITIATION	0:00	5555	-5	52700	0
THROTTLE TO MAXIMUM THRUST	0:26	5527	-4	52600	28
YAW TO VERTICAL	3:00	4096	-56	46840	1476
THROTTLE RECOVERY	7:20	1188	-91	24740	4559
HIGH GATE	9:20	342	-174	7970	5602
LOW GATE	10:42	76	-21	583	6246
LANDING	12:01.5	0	-5	0	6697

per second. We have only started to go down slightly. Our H dot is four feet per second. We are still at 52,600 feet and our Delta V, we use -- is 28.

And the command module in the meantime is way back. Now, at eight minutes into PDI when the LM is up at this position the command module is here. And at landing, when the LM is landing, the command module will be almost directly overhead.

Now, the high gate, the H dots and so forth, I think you are all familiar with and I won't go into that detail.

Next viewgraph, please.

(Slide.)

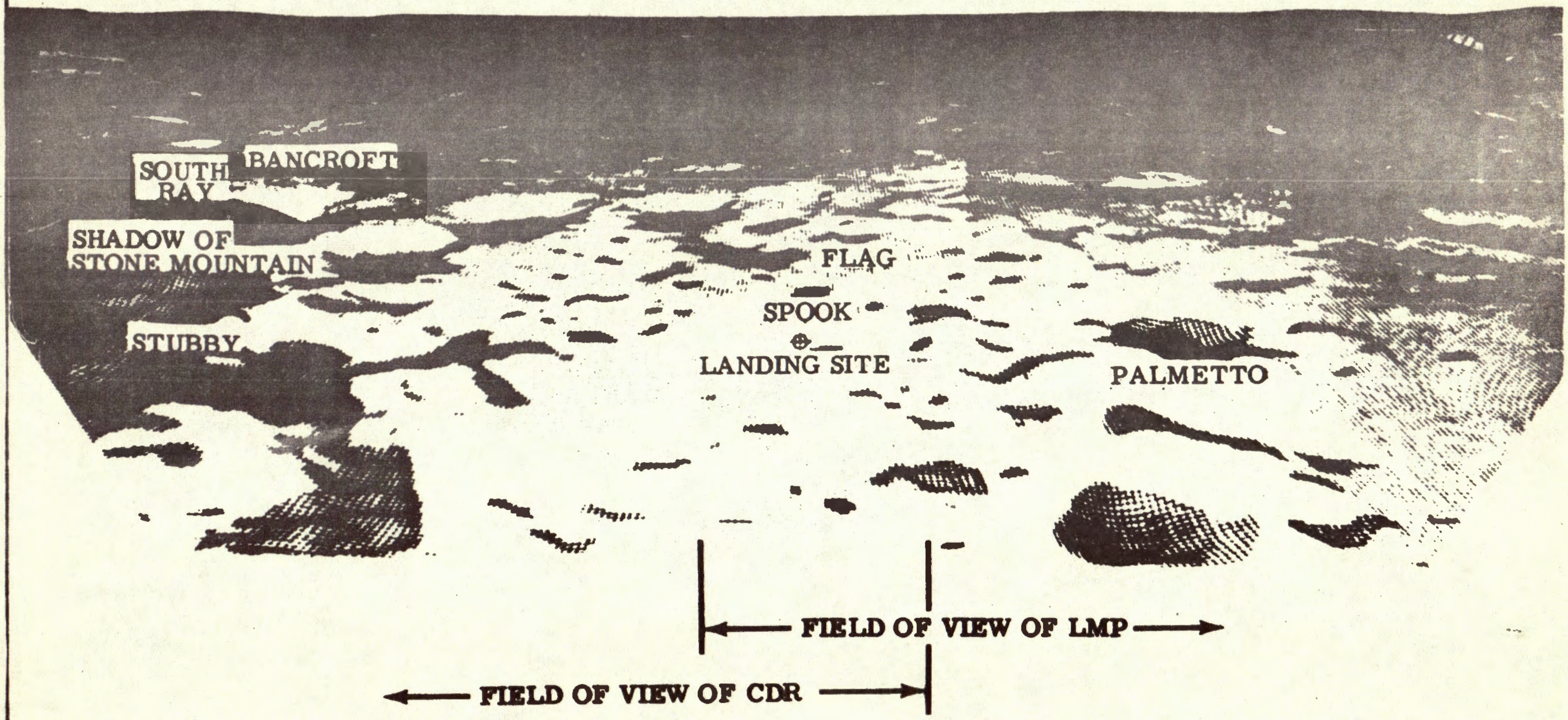
Now, what we have tried to show here are some scenes. These are computerized scenes of Descartes.

(Slide.)

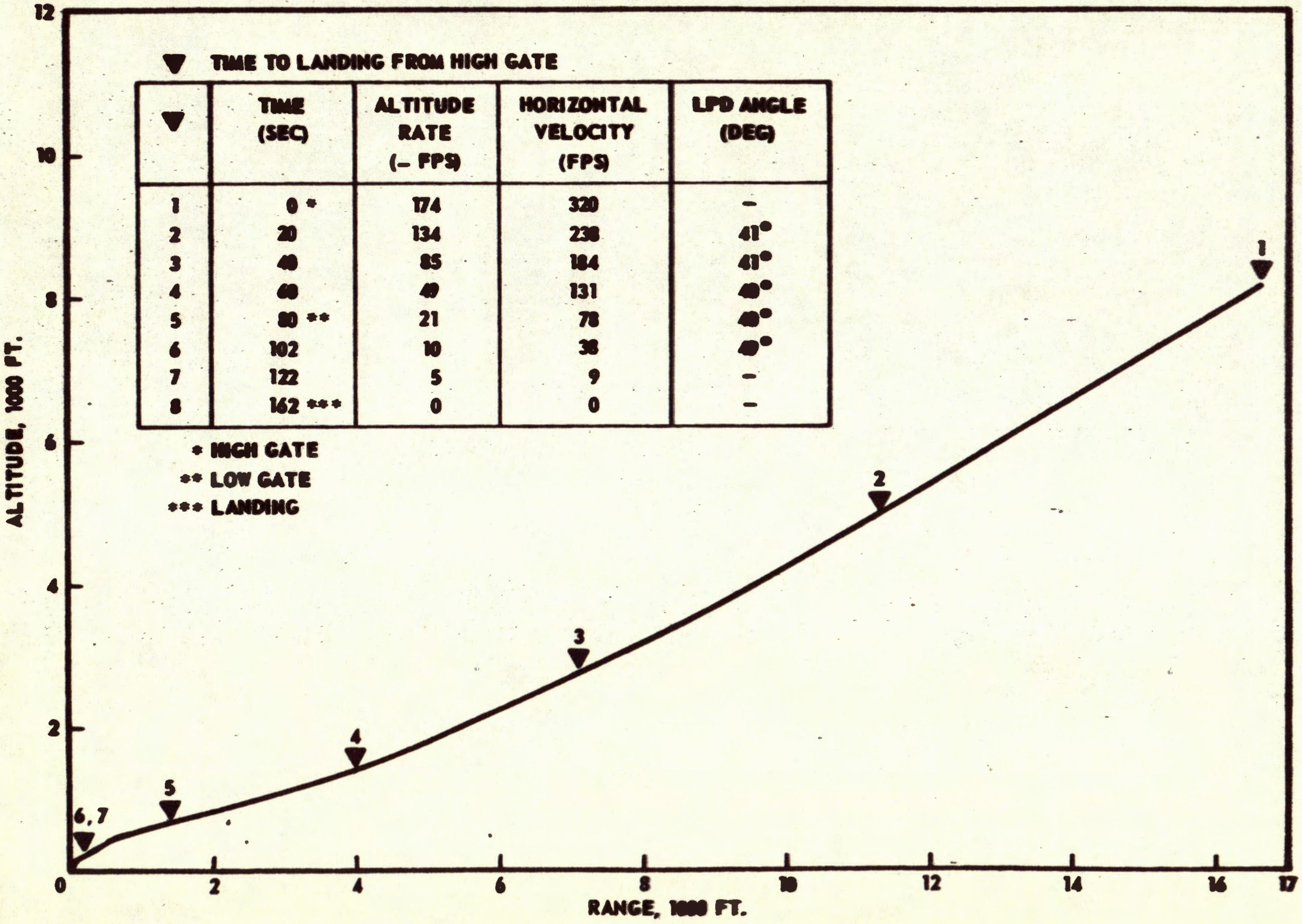
This is the trajectory coming down. I am going to try to relate now the numbers which on the next viewchart show you scenes.

Actually what I want to show here is that from the red line to the right, that is the view that Charlie Duke should see. And I guess I want to impress upon you that this doesn't look as sharp and delineated as the Hadley Apennine where you had pretty sharp distinguishing features. You don't have a big rille there. And this is the best, we think, right now. It may be more subtle than this. But this is the way

FIRST VIEW OF DESCARTES
(HIGH GATE + 8 SECONDS)



APPROACH PHASE



▼ TIME TO LANDING FROM HIGH GATE

▼	TIME (SEC)	ALTITUDE RATE (– FPS)	HORIZONTAL VELOCITY (FPS)	LPD ANGLE (DEG)
1	0 *	174	320	–
2	20	134	238	41°
3	40	85	184	41°
4	60	49	131	40°
5	80 **	21	78	40°
6	102	10	38	40°
7	122	5	9	–
8	162 ***	0	0	–

* HIGH GATE
** LOW GATE
*** LANDING

we are looking at it right now.

The predominant, as you will see from the views we have taken from the simular and the film -- it will just take a few minutes -- note that this is sort of a fishhook and this is sort of the key distinguishing feature for this site.

Now, these are Flag and Spook, two large craters besides this group here, and the landing site is about a kilometer short of Spook Crater.

Now, the view from the blue to the left is a view that John Young will see. So, you see, he has his distinguishing features and Charlie, I think, is going to take a look out when he is not too busy and perhaps give John a hand. At least this is the way he has been doing it in training.

Next viewgraph, please.

(Slide.) (not included herewith)

Now, this is a view of a picture taken out of the simulator and this is at 5000 feet. We have 99 seconds of designation remaining that we can do and the target is at 37 degrees. The landing point is about right here at 37 degrees on the LPD.

Our horizontal rate of descent, H dot, is 132, 133 feet per second and we are at 5000 feet.

Now, notice here is your hook, Stubby, Wreck, Trap and Cove and Flag and Spook.

Now, it looks pretty good to us but you can imagine how it -- when you pitch right over it will be a job for John and Charlie to make sure that they are right down the line. We are confident they will be and, as you recall, we have three nav corrections we can make after the PDI that we incorporate in Apollo 15 and we will be able to do again here.

Next view, please.

(Slide.) (not included herewith)

Now, the number two spot, you are about 11,000 feet from the target in horizontal range. You are at 3000 feet altitude. You are coming down at 87.5 feet per second and the target is at 39 on the LPD and it is pointed out right here.

Here again is your Spook and Flag and here is your hook.

Next view, please.

(Slide.) (not included herewith)

This is at 1000 feet. Your rate of descent is 35 feet per second and the target is at 39 and you can see there is a little double spot they call it, this is what they are using, and they want to land just to the right of the largest of the double spot.

Now, let me make clear, that is the target. In talking to John and everybody -- anyplace in that vicinity is good. He doesn't have to land right on the dot, so to speak.

Next viewgraph, please.

(Slide.) (not included herewith)

This is at 500 feet. This is normaly where the pilot, the commander, has usually taken over, a little higher, about this altitude, he has taken over and brought it in. We are at 500 feet. The rate of descent is 16 feet per second and the target is at 42. We have got a little cross there to show you and here is your double spot.

Now you can see your hook has vanished and Spook and Flag are very, very indistinguishable. By this time he has picked out his smooth spot and he is going to land.

Next viewgraph, please.

Film? Okay. We have got a film that will just take a few minutes. It is taken from the simulator. It starts at pitch-over and you can see coming down, see if you can't pick out some of these spots that I have pointed out.

If I can help, I will.

(Film presentation with commentary.)

This is pitch-over, high gate, and this is a mountainside here and you get to see the hook right here. And then Flag and Spook are right in this area. Target should be about in -- right in here or just above that. I can't read those numbers. Probably right about in there.

Now we are at 4000 feet coming down about 100 feet per second. Target is at LPD of 40.

Now, this is false right here. This is part of the model problems that we have.

You will recall that the Apollo 15 crew picked out their landing site at about 2000 feet. Dave says "I have got my spot" and went right there. We are now at 1500 feet coming down 48 feet per -- 44 feet per second with the target at about 38 degrees.

Now, you see at this altitude you start to lose the hook and he should have picked out his spot and will have picked out his spot by that time.

This is about where he goes into Program 66 and where he takes over. Coming down about 13 feet per second. He is about 400 feet.

Very shortly he will start -- this is a double spot that they talk about and very shortly he will start his vertical descent, straight vertical.

We have tried to simulate some dust. You will see that. And then it clears up as they touch down. This is simulating the dust effects.

He is still about 50 feet off.

That is the LM shadow. There it clears up.

Landing.

Film off, please.

Next viewgraph.

(Slide.)

Now, as far as the lunar surface timeline goes, this is not as detailed, of course, but gives you what I was trying to point out earlier, wake up until they repress after EVA will be no longer than 18 hours. During that time they don their suits, their pre-undock LM activities, they undock from the command module and do their cabin configuration ready for PDI, do their landing, brief, and prepare for the EVA and then go out seven hours, come back in, debrief, stow, eat, get ready for a good night's sleep. And note that we have tried to emphasize again and again that we want eight hours' sleep. And these total periods are stretched out with that additional six hours we have added to the lunar surface stay time.

Next viewgraph, please.

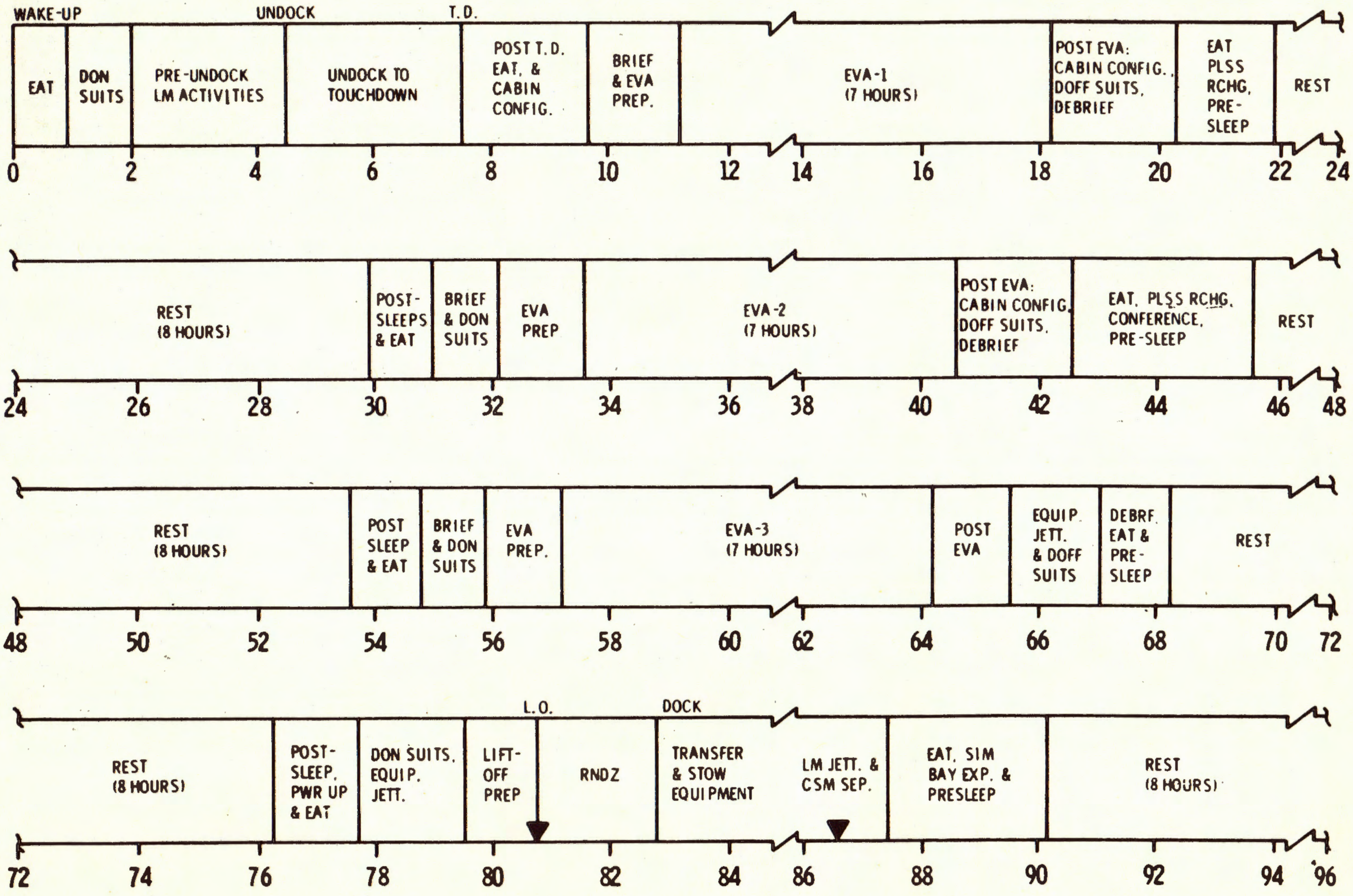
(Slide.)

This is one that I think you are familiar with. It is a plan view looking at how we will -- how the LM operations at the start of the first EVA will go.

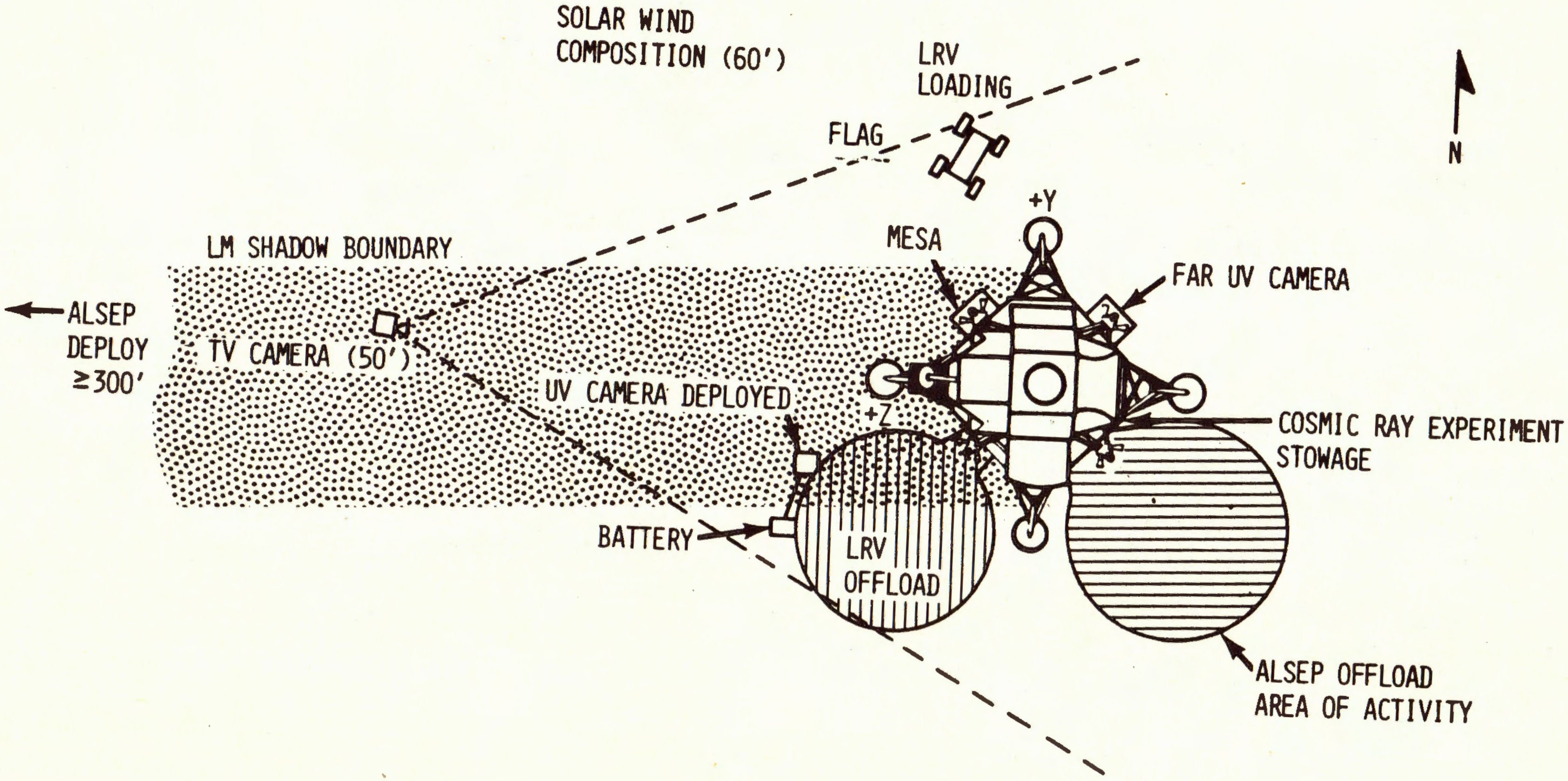
You will recall the mesa, the ladder and the mesa which has a TV should catch the descent of the commander to the surface.

We will come around and deploy the lunar rover as we did on Apollo 15. Following that the rover will be driven

APOLLO 16 LUNAR SURFACE TIMELINE



NEAR LM LUNAR SURFACE ACTIVITY



around and while Charlie Duke is going through stowing, preparing the LRV for the traverses John Young will deploy the far UVcamera, bring it out, place it here in the shadow of the LM -- it has to be in the shadow -- set up the first reading and put the battery in the sunlight and then the -- before that, I should say, they have taken the TV out and put it on the post out here to give us a view of all these areas.

They will come back then and get into the ALSEP deployment, get everything loaded, will go out and deploy the ALSEP and then go on the traverse.

Next viewgraph.

QUESTION: It is in the shadow of the LM?

LEE: Yes, always facing west. The sun is facing east.

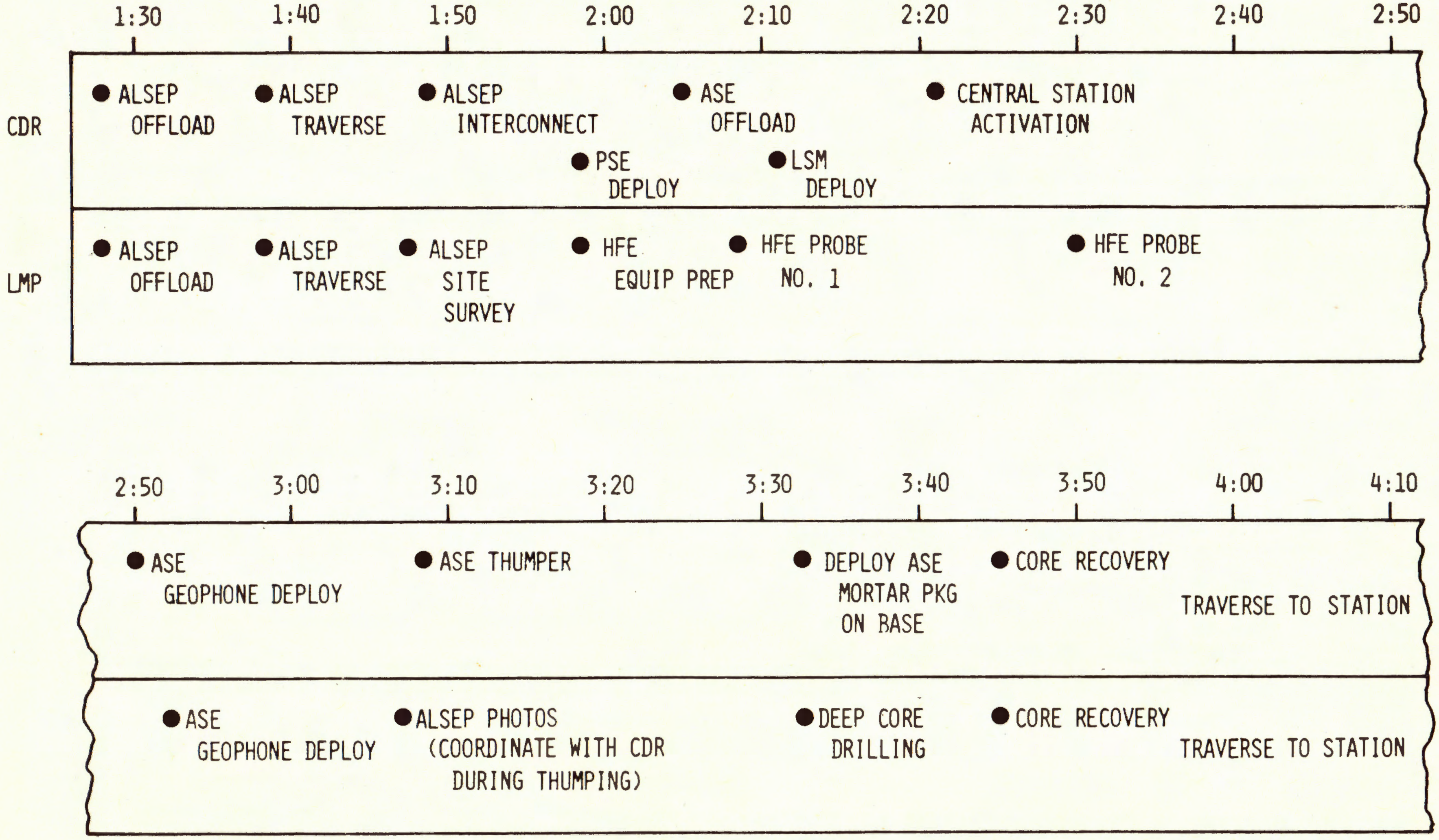
(Slide.)

The summary time line for the ALSEP deployment, I just point out here that from the overhead, by the time you get the lunar rover and the ALSEP deployed you have gone into your EVA time and you start to deploy your ALSEP. The ALSEP itself takes over two hours to deploy.

Now, these are the main sequence of events in the deployment of the ALSEP. I think many of you were at the science briefing. You know this central station, magnetometer, the active seismic, the passive seismic and the heat flow and the thumper experiments.

SUMMARY TIME LINE

FROM ALSEP OFFLOAD THROUGH ALSEP DEPLOYMENT



Next viewgraph, please.

(Slide.)

This is the position that the crew is trained to position the ALSEP experiments. We will use the rover to get an accurate azimuth here for deployment of the geophone line and we want to get a sun azimuth and we will move the active seismic then and try to make it exactly parallel to the geophone cable line out here for the thumper and, of course, when the motors are fired they should pick those up.

And we have the central -- the generator, of course and the passive seismic experiments shortly.

Note the one difference on the active seismic. On Apollo 14 this distance was only ten feet and that is one of the reasons we haven't fired it yet, it is so close to the ALSEP we are afraid dust and everything would put the ALSEP out. So we want it to go as long as possible. This will be out fifty feet now.

QUESTION: When do you off-load the rover?

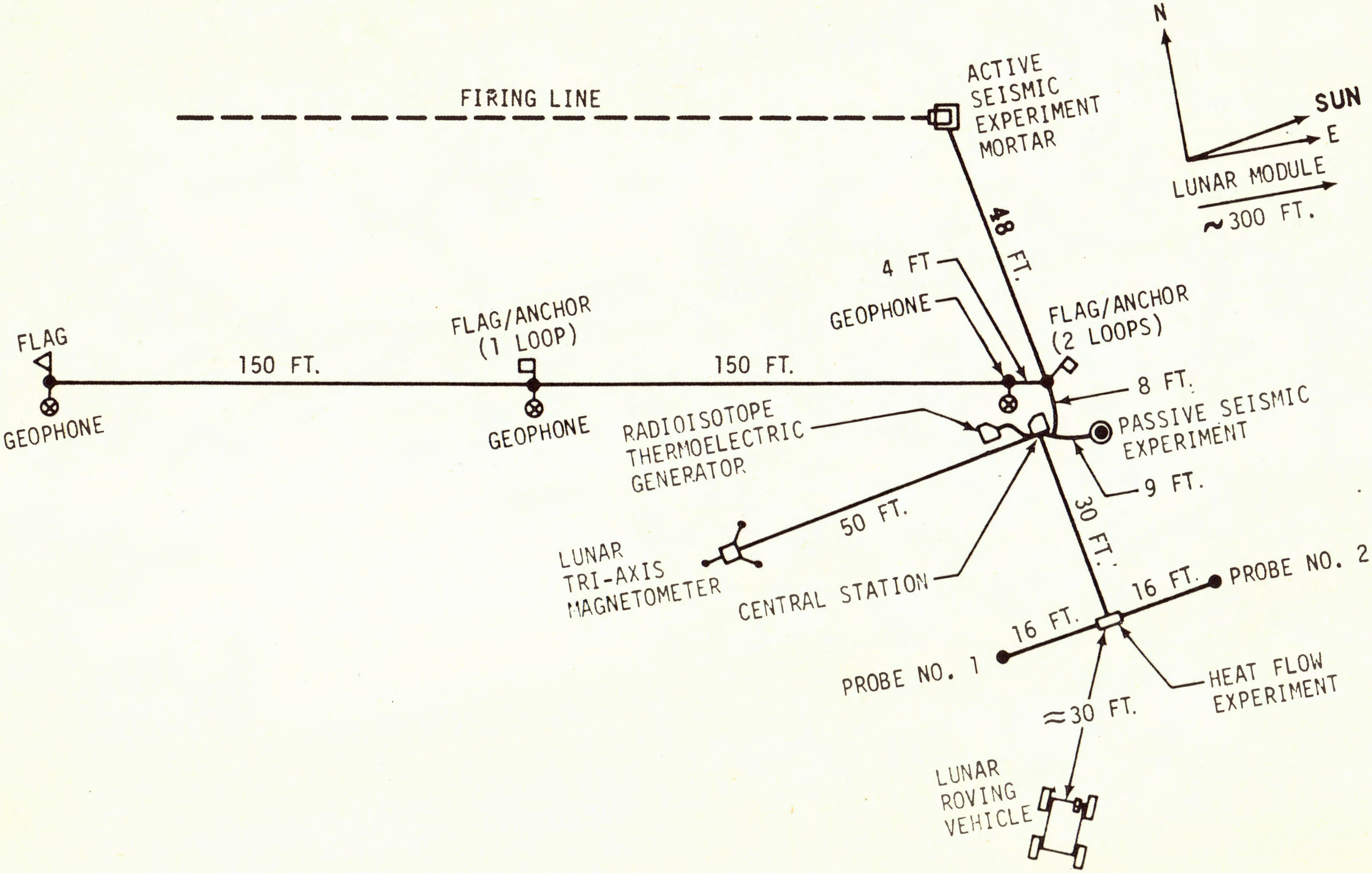
LEE: That is the first thing.

QUESTION: Before ALSEP?

LEE: Before ALSEP. After TV, yes. The TV will be deployed out 50 feet to see the deployment of the rover.

And in this area we will do the heat flow experiment and the core. You will recall the one that gave us so much trouble again and this one we have made improvements and

APOLLO 16 ALSEP DEPLOYMENT



the tests we have run in the practice EVAs they have run at the Cape we feel quite confident that the core drill work much better and we won't have the problems we had on the previous mission.

Next viewgraph, please.

(Slide.)

Now, this is two viewgraphs to show you our current planned traverses. And this is with the rover. Later I will show you if we should have to go to walking traverses what we plan.

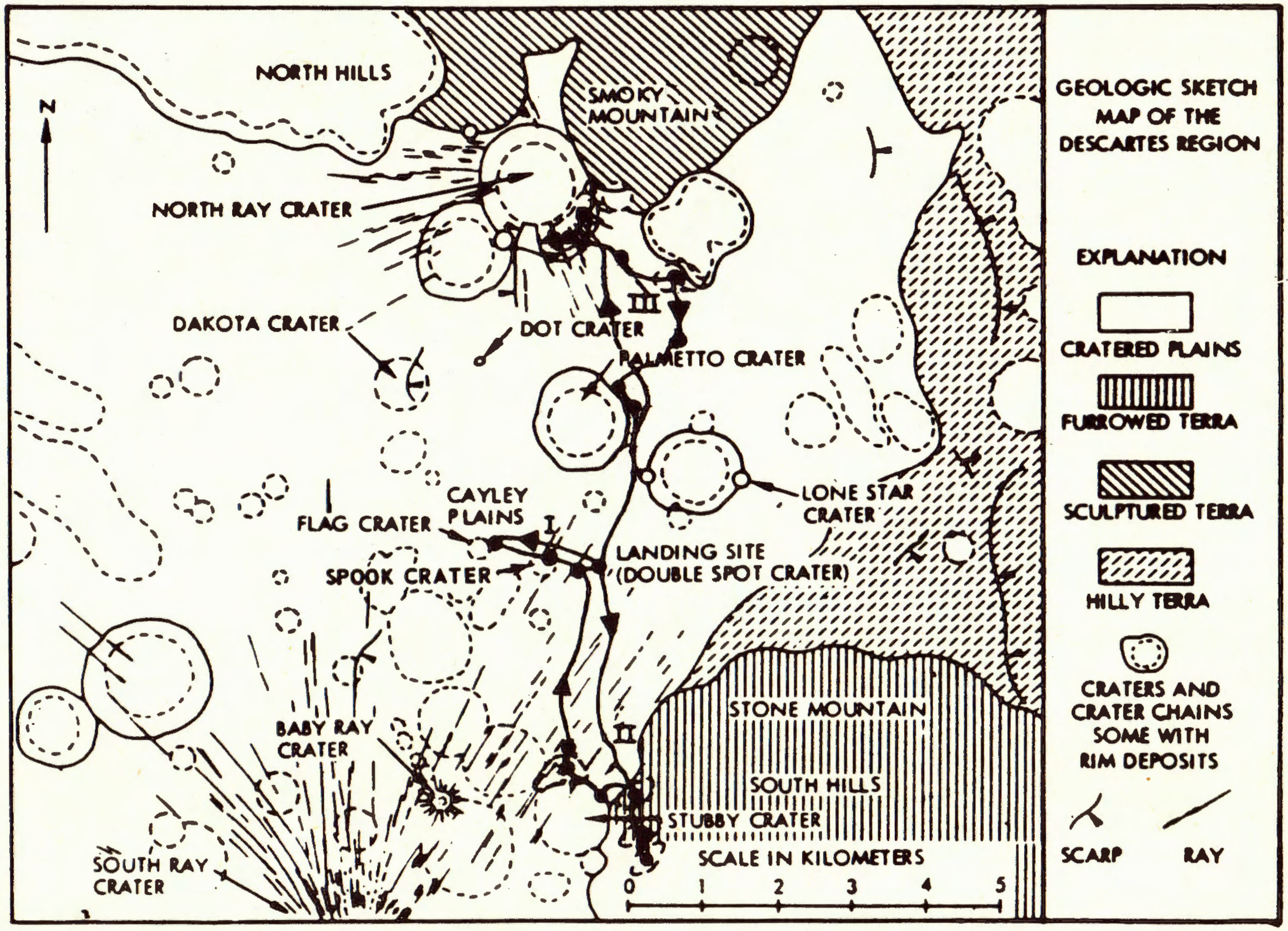
The first EVA, of course, will be to the west. And the ALSEP will be deployed and we will continue on out to Station 1 and return to the LM.

The second EVA, the objective is to get to this front. Now, this is about a 12 degree slope. I think if they get to this spot -- and, again, I don't want to say hey, they have got to get to this spot to be successful. What they want to do is get to the mountain front.

Now, it could be that they -- they obviously know they cross the point back here. They don't have to go any further.

The slopes are about 12 degrees. However, there are some slopes that may be as high as 25 degrees. We are going to have to wind around these and try to maintain the average rover slope that it is climbing as 12 degrees.

APOLLO 16 LRV TRAVERSES



They return, they come back to the LM, and then a third EVA -- I am sorry. Here, after they get to the front, the other thing they want to do is come over toward the Baby ray, South Ray crater.

These rays here -- I don't know that they will see that distinguishing color on the surface itself, but they indicate there ought to be boulders in that so we want them to come over and try to look in this area if at all possible.

On EVA.3 they will -- the objective is to get to the vicinity of North Ray Crater. And let me point out that we know there will be large boulders here. We are not sure of the exact track that John and Charlie will be able to go. We hope to get some assistance from Ken Mattingly in orbit. If he can see anything that looks like a better traver se path, why, he will certainly pass that on to us.

Now, we don't necessarily -- to accomplish the objectives -- have to get right on the rim. We hope to get close enough that maybe we can take a picture of the far side.

On the left viewgraph is a different perspective. It gives you an idea of the geological sketch of the area. Compared to this one you will see the Stone Mountain and then your hilly terra here and your North Ray Crater up in this area. We hope to go up in this vicinity and then over to this crater and back to Palmetto and then in.

And this is Baby Ray. These are rays and we think that there should be some craters. And Caley, of course, we hope to get in this area here on the first EVA.

Next viewgraph, please.

(Slide.) (not included herewith)

Now, very quickly on the time lines, I think you are familiar with these. Just breakdowns. Station 1 which is Flag Crater. The time we are going to be there. The overhead. We hope to have TV in all these so you can watch what we are doing along with -- all of us can watch what they are doing.

The raked soil sample. The sampling. These are general events that they are going to do.

The LPM site measurement we, of course, haven't done since Apollo 14. That will be new and different from 15. This will be done at Station 2. And Station 3, Grand Prix, is actually where we are going to run the rover to get some good engineering data on just how the dust kicks up and how the wheels spin and so forth.

We haven't been successful in doing it and we are going to take a crack at doing it here. We are going to devote eight minutes where John will drive the rover and Charlie will take some pictures, 16 millimeter pictures, to return to earth.

VOICE: John will like that.

LEE: Yes.

Let's see. What else on this?

QUESTION: Could you tell us a little more about that particular operation, the one with the eight-minute thing?

LEE: Briefly --

QUESTION: What do you call it?

LEE: We call it the Grand Prix which is not a good name. I am sorry about that. But changing names is very difficult sometimes once they get hung on.

But, actually, he is going to go out -- I have forgotten the distance, Peter, and he is going to -- like you have got a triangle, say, going out from Charlie taking pictures, and he is going to go at a certain speed past the bearing limits of this angle, so to speak, at a certain distance so that at this speed we can get engineering data just whether the wheels are slipping, how much dust they are picking up and so forth.

We have never really gotten any of this on the LM. You recall TV isn't on when the LM is going. We do have some pictures taken from the moving LM -- rover, excuse me, but we don't have the pictures that we feel provide engineering data that could help in years to come on other items traversing the lunar surface, other vehicles.

QUESTION: Are you going to run it full out? Wide open?

LEE: It depends on the surface. I am not sure whether we are or not. I think twelve clicks is the most we got last time and I wouldn't be surprised if the terrain is nice, fairly flat and that, that John will give it twelve clicks.

Next viewgraph, please.

(Slide.) (not included herewith)

Now, this is the second EVA. Again it is a gross idea of the events that will occur at Stone Mountain.

We hope to spend 58 minutes at one station and Station 5, 40 minutes, and these are, you know -- Station 4 is the furthest one and that is about 4.2 kilometers from the LM is the furthest distance, if he goes that far.

At the base of that Stone Mountain he will spend about 20 minutes and then we are right back to the LM.

QUESTION: Do you know how far Station 4 is?

LEE: From the LM?

QUESTION: Up the Stone Mountain face.

LEE: Oh, no, I don't have that. We can guess it might be -- let me see here.

QUESTION: I was thinking of altitude.

LEE: It ought to be -- oh, it is about 600 feet, I believe, above the surface where the LM is. Caley's Plain. It is about 600 feet, 200 meters. Elevation is what you wanted; is that right?

VOICE: That would be a hell of a view is the point.

LEE: Yes, it ought to be a very good view.

Next viewgraph, please.

(Slide.) (not included herewith)

EVA 3, of course, is to the North Ray.

That is 2 continued. I am sorry. Next viewgraph, please.

(Slide.) (not included herewith)

EVA 3 is to North Ray. You will see we are spending -- planning most of our time in those areas, 53, 56 minutes. We are going to try to get some polarmetric photography which we haven't been successful in doing yet. And the usual 500 millimeter photos, sampling. I think you are familiar with all those and I don't need to go into further detail.

Next viewgraph, please.

(Slide.) (not included herewith)

This is a continuation of the stops 14, 15 and 16. Up in this area. And, let's see, these are the areas that we are going to take, as I recall. Floyd or Don, correct me. Where we are going to do the portable magnetometer readings.

We are going to do the portable magnetometer readings in these stations, 15, 16 and 17. And you see here we have two measurements. That is where we are going to a special measurement on a sample we put on a magnetometer for this magnetism that you have heard of to make comparisons with the four grams we are taking to the moon and returning, to see how much of that soft magnetism is induced to the moon and back and to Houston.

Next viewgraph, please.

(Slide.)

Let me say that on those EVAs, all those, we are prepared to -- we have priorities. We are prepared, if we get behind time, to drop back.

For example, on EVA-1, if we find we run into problems like we did on Apollo 15 and we don't have as much time, if we get 15, 20 minutes behind we will probably knock off Station 1 and just do a lot of the stuff you were going to do at Station 1, do it at Station 2 and save the traverse time going out to Station 1.

So we do have priority lists set up so that in real time as we go along, depending on how far we are behind, we will drop some of these items.

Now, this is a comparison with Apollo 15. I think you are familiar with the plan duration. We were one hour less on Apollo 15. We actually got eighteen hours and thirty-three minutes out on EVA.

On traverse time we plan seven hours and fifty-three minutes to various stations. We have only got five. We are

APOLLO 16 TRAVERSE COMPARISON WITH APOLLO 15

	DURATION (HR:MIN)		TRAVERSE STATION TIME (HR:MIN)		LM/ALSEP AREA TIME (HR:MIN)		LRV DRIVING TIME (HR:MIN)		TRAVERSE DISTANCE (KM)	
	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL
EVA I										
APOLLO 15	7:00	6:32	1:16	1:10	4:35	4:14	1:08	1:08	8.2	10.3
APOLLO 16	7:00	-	1:53	-	4:41	-	:26	-	3.2	-
EVA II										
APOLLO 15	7:00	7:12	3:32	2:37	1:29	3:11	1:59	1:24	14.3	12.5
APOLLO 16	7:00	-	4:11	-	1:30	-	1:19	-	9.5	-
EVA III										
APOLLO 15	6:00	4:49	3:05	1:23	1:27	2:50	1:28	:36	10.5	5.1
APOLLO 16	7:00	-	3:36	-	1:40	-	1:44	-	12.6	-
TOTALS										
APOLLO 15	20:00	18:33	7:53	5:00	7:31	10:15	4:35	3:08	33.0	27.9
APOLLO 16	21:00	-	9:40	-	7:51	-	3:29	-	25.2	-

planning nine hours and forty minutes on this one. And in the LM ALSEP area we plan seven hours and thirty-one minutes. We actually spent ten hours and fifteen minutes. And this is part of the problems we had in deployment of the rover, the core, and so forth. We are planning seven hours and fifty-one minutes in Apollo 16. And we have taken in and said here, we are going to allow so much time for drilling the core and then we will probably knock it off if we don't get it done within certain limits.

And we have that set up for most of the experiments if we run into problems.

On the driving time, a comparison, of course, on Apollo 15, four hours and forty-five minutes, we actually did three hours and eight minutes because we never really did an EVA 3 to the secondary complex I believe to the north.

On this mission we are not planning as much driving time. We are not going to cover as much distance, as you can see here. We are planning 25.2 kilometers for Apollo 16 because that gets us to our primary objectives and that does not include -- that is map distance. That doesn't include the 10 percent wander factor for missing craters and so forth.

Next viewgraph, please.

(Slide.) (not included herewith)

I think we have now come to liftoff. We again will position the rover with the TV and I hope we have made the correction to the clutch and everything that we can track the -- instead of just watching the LM lift off we hope we can track it a little bit and perhaps see it a little longer than we did on Apollo 15.

Docking will be the short -- we plan the short docking as we did on Apollo 15.

Now, the LM jettison, we will jettison the LM as we did on previous missions for an impact on the moon. And I will show you that -- why don't you give up the next viewgraph.

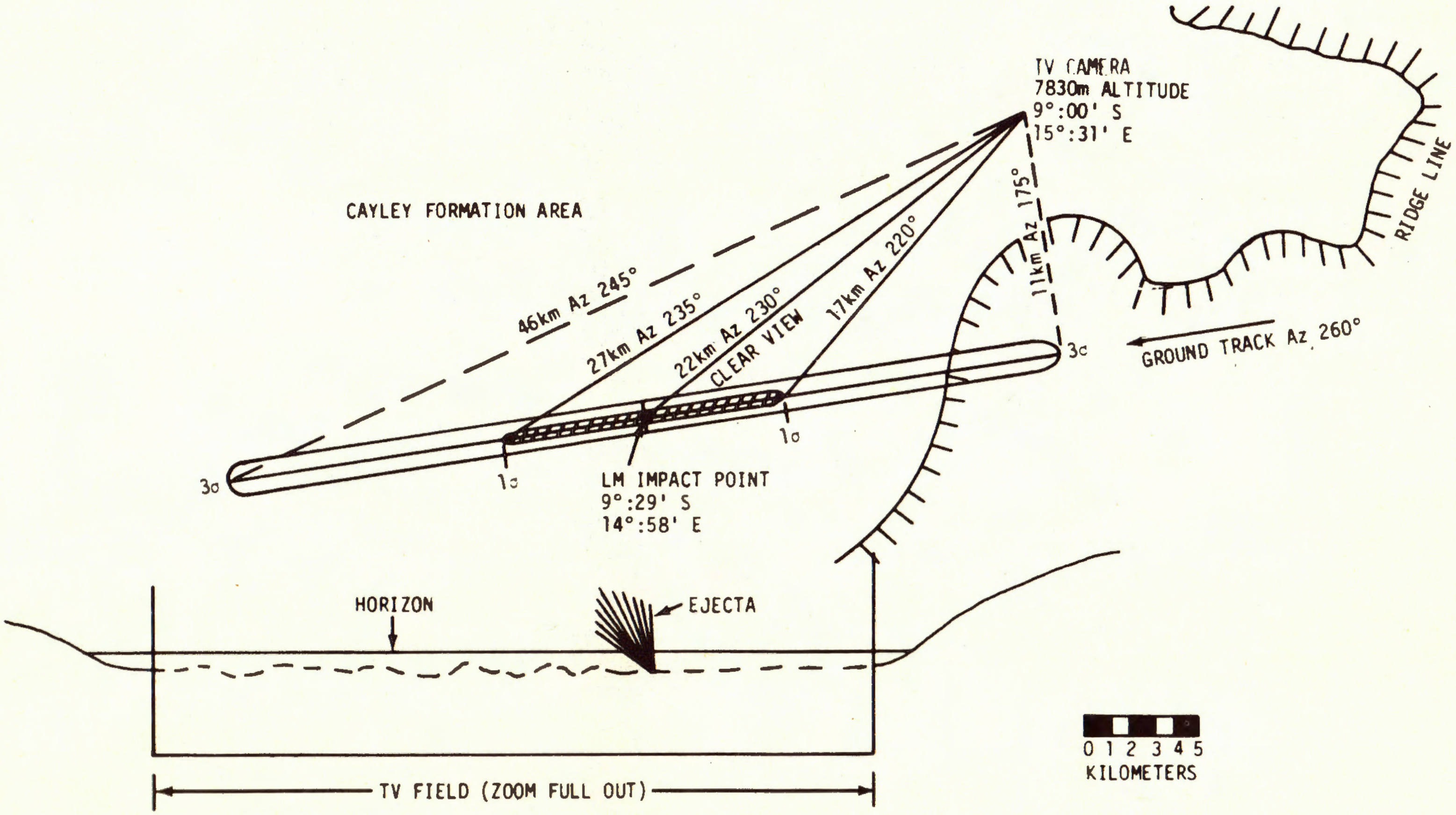
(Slide.)

We are doing something. I hesitate to bring this one up, really. Wehave changed the LM impact point slightly. This is your probable area. And, you know, most of your error is in range and not cross-range.

This is the position of the LM where we will have the lunar rover with the TV camera. We are going to point it in this direction. We are going to try to impact the LM at this point. And you can see that is some 22 kilometers. It is over the horizon as depicted here. And some people hope that maybe we can see the ejecta from the LM impact.

VOICE: You don't have that listed as one of your television events on a later chart here. That impact comes at 179 hours and you don't have anything in here as a

LUNAR IMPACT TARGET FOR SPENT LM ASCENT STAGE



television event for that time.

LEE: You are correct, Bill.

QUESTION: Aren't we going to see it?

LEE: I can't give you a good answer on that. I will have to look at that a little bit more.

QUESTION: You lost me completely. Did you say you were going to set this up to see it and did you say we may not see it?

LEE: My own personal view is that you will be looking with the TV camera 22 kilometers at a site, 22 kilometers, and the only way you will see this is if the ejecta comes up above the horizon. And even then, whether the television will pick up that ejecta, is difficult --

QUESTION: How far away is it?

LEE: About 22 kilometers.

QUESTION: But you are going to try to do that?

LEE: Yes, we are going to try to do that.

Don't let me downgrade it. I hope it works. I don't mean to downgrade it. I just don't have much hope of seeing the ejecta.

Following -- we will spend two days on our orbital experiments and you can see the accumulated time here on the various instruments, 140 hours on the gamma; alpha 140 hours; the X-ray, 110 hours; mass spec, 110 hours; and so forth; laser altimeter, 19 hours.

We will do, as I told you earlier, a plane change if, providing real time, we are confident we have the SPS margins to get us a little bit of better coverage.

The shaping burn is actually for the subsatellite launch before ETI.

Can I have the next viewgraph, please?

(Slide.)

I wanted to show you here what we gain essentially by the -- not colored is the area covered by the Apollo 15, near side and far side. Photographs and X ray and alpha and so forth.

In color are what we hope to cover with Apollo 16 and we have shown the different times. The green is from LOI to the first plane change for rendevouz purposes and the yellow is after that until we do this, the second plane change, and the blue is the area that we gain by doing that second plane change.

And I think I have another chart that shows you essentially what we gain.

Could I have the next viewgraph, please?

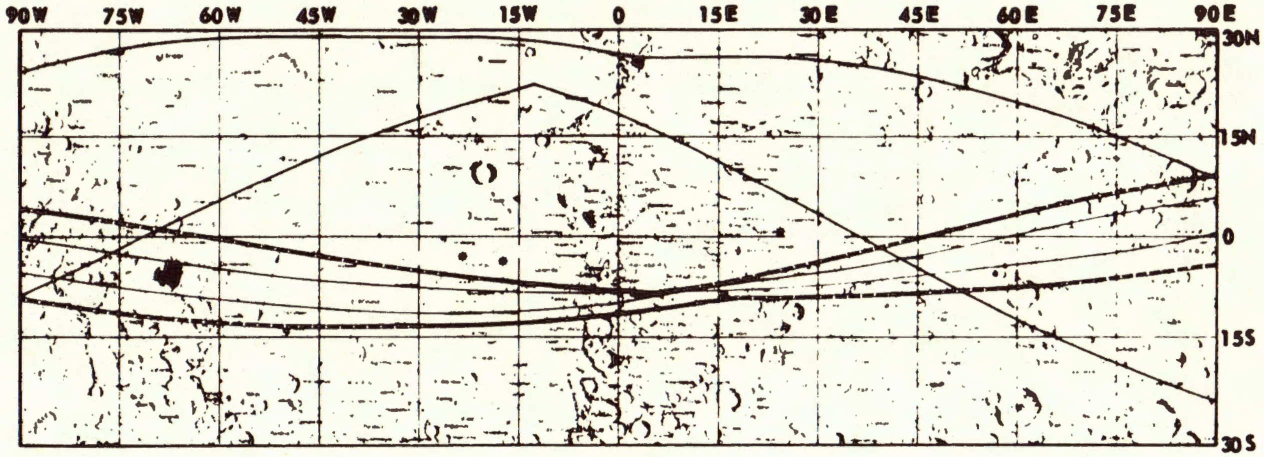
(Slide.) (not included herewith)

This is again another comparison of the Hadley Apennine area covered by the moon. This is what we hope to get on the Descartes mission.

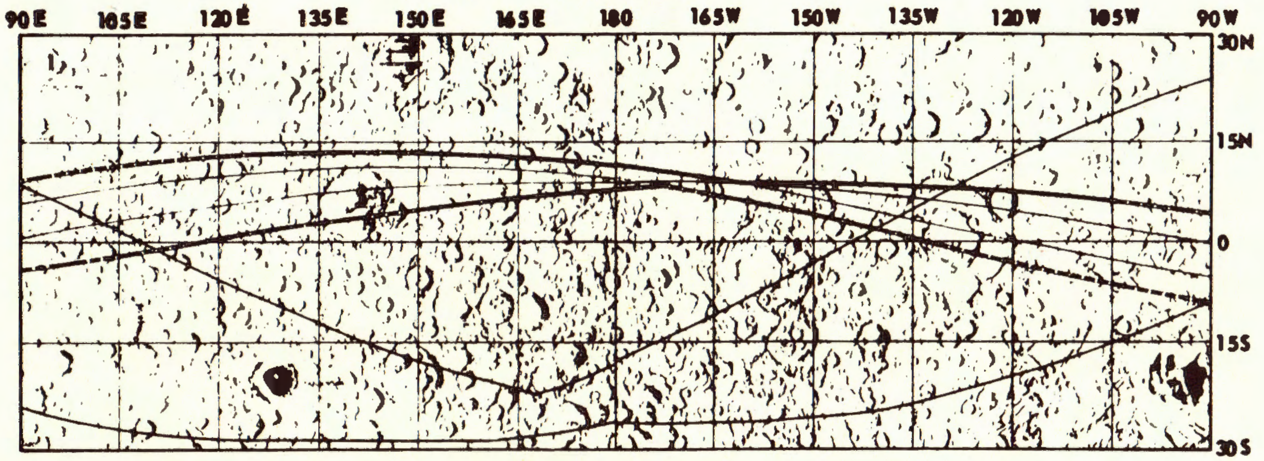
On Apollo 15 this is the percent coverage of the

APOLLO 16
POTENTIAL LUNAR ORBIT COVERAGE

NEARSIDE



FARSIDE



▭ LOI TO LOPC1 - 77 HR. 57 MIN. 9° INCLINATION

▭ LOPC1 TO LOPC2 - 41 HR. 34 MIN. 10.4° INCLINATION

▭ LOPC2 TO TEI - 28 HR. 16 MIN. 13.4° INCLINATION moon. You see in Apollo 16 we don't pick up quite as much as Apollo 15 and that is because primarily of the lower latitude of the landing site.

You see, these are the percentages of new area that are covered by the orbital experiments.

QUESTION: You won't fly over the Apollo 17 site again, will you?

LEE: No. We have good pan camera views of that site.

Next viewgraph, please.

(Slide.)

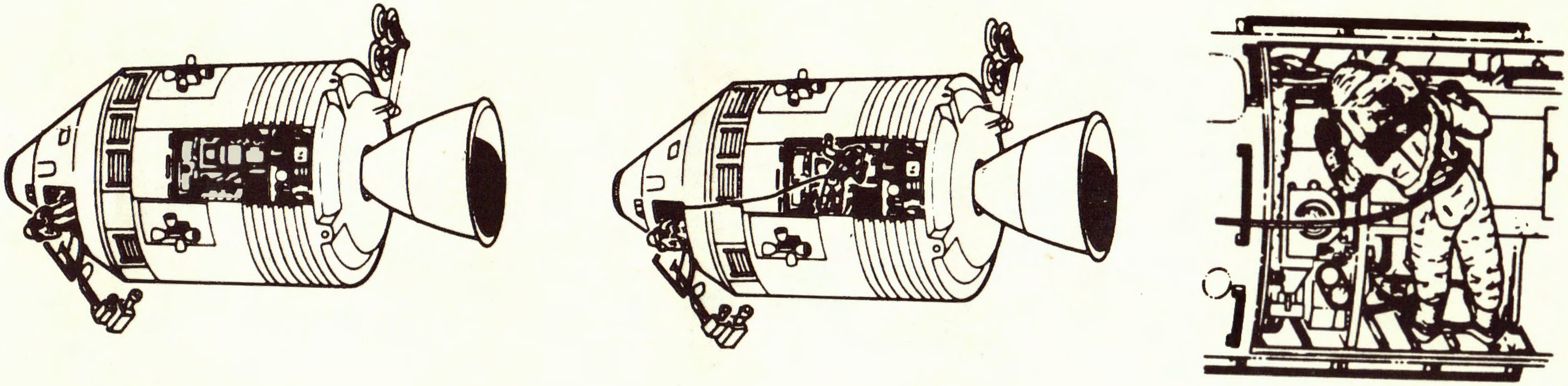
Very quickly the EVA, of course, to retrieve the films are located in this spot and this spot (indicating) and I am sure you are all familiar with the SIM BAY location of mass spec, alpha particle x-ray and your laser and mapping camera here and your big pan camera here and the subsatellite sits in this position and this is the foot constraint that the CMP will use.

Next viewgraph, please.

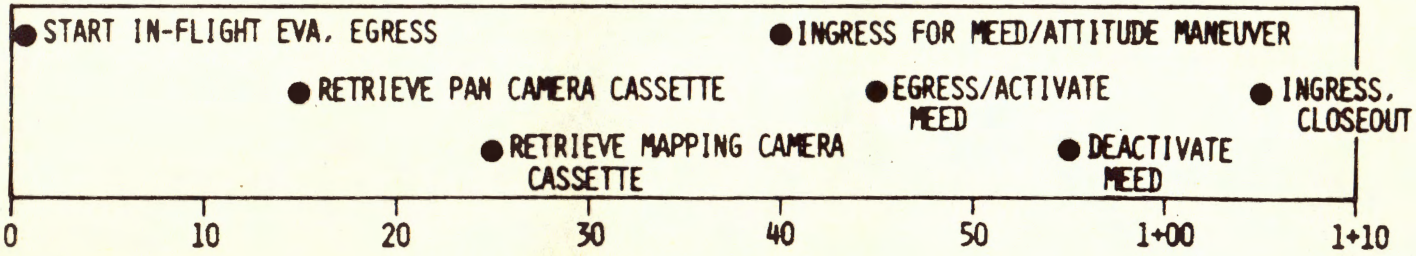
(Slide.) (not included herewith)

Again, this is the EVA time line someone was asking about earlier. He will come out. We figure he should have the casettes back in, both casettes back in by 25, 30 minutes. He will come back here, ingress for the MEED, attitude maneuver, and then after we have gotten the correct

FILM RETRIEVAL FROM THE SIM BAY



EVA TIME LINE



sun position he will egress and activate the MEED on the hatch and ten minutes later de-activate, ingress and close out from the EVA. We have an hour and ten minutes we are planning on this.

QUESTION: I hate to keep harping on this, but your TV schedule shows a TV duration for this even of an hour and ten minutes which would include the MEED experiment. Now, are we really to expect TV for about forty minutes?

LEE: I would guess that is about what you will get. If things go on schedule he should be finished and the TV should be stowed back in the command module in forty minutes.

As you recall, Al was back in fifteen or twenty minutes, he retrieved the films.

QUESTION: Is he going to return to the cabin during the time the MEED is being exposed or is he going to sit on the door sill or what?

LEE: He will probably be right in the door. He is going to come back in, get into the door and, while we do the attitude maneuver, and then mount the MEED -- well, he has mounted the MEED and do it, and, see, he wants to visually substantiate that that sun angle is correct and then that is ten minutes.

I don't know whether he will stand there the ten minutes and take a view of the -- I imagine he will. That is a view very few human beings get to see. And then when the ten minutes are up he will retrieve the MEED experiment and enter into the command module.

QUESTION: It says egress, activate MEED. Does that mean standing up in the hatch?

LEE: Yes. That is all he has to do. Pulls a ring and it snaps open.

Next viewgraph, please.

(Slide.) (not included herewith)

This is again a picture of it mounted. I think you have seen that before on the CSM hatch. That is the MEED.

Next viewgraph, please.

(Slide.)

We come back in and of course recovery. I wanted to point out here that our 400,000 feet interface is at about this point. We are coming in instead of 40 degrees, we are coming in at a 60-degree inclination. That is a nominal and optimum reentry trajectory.

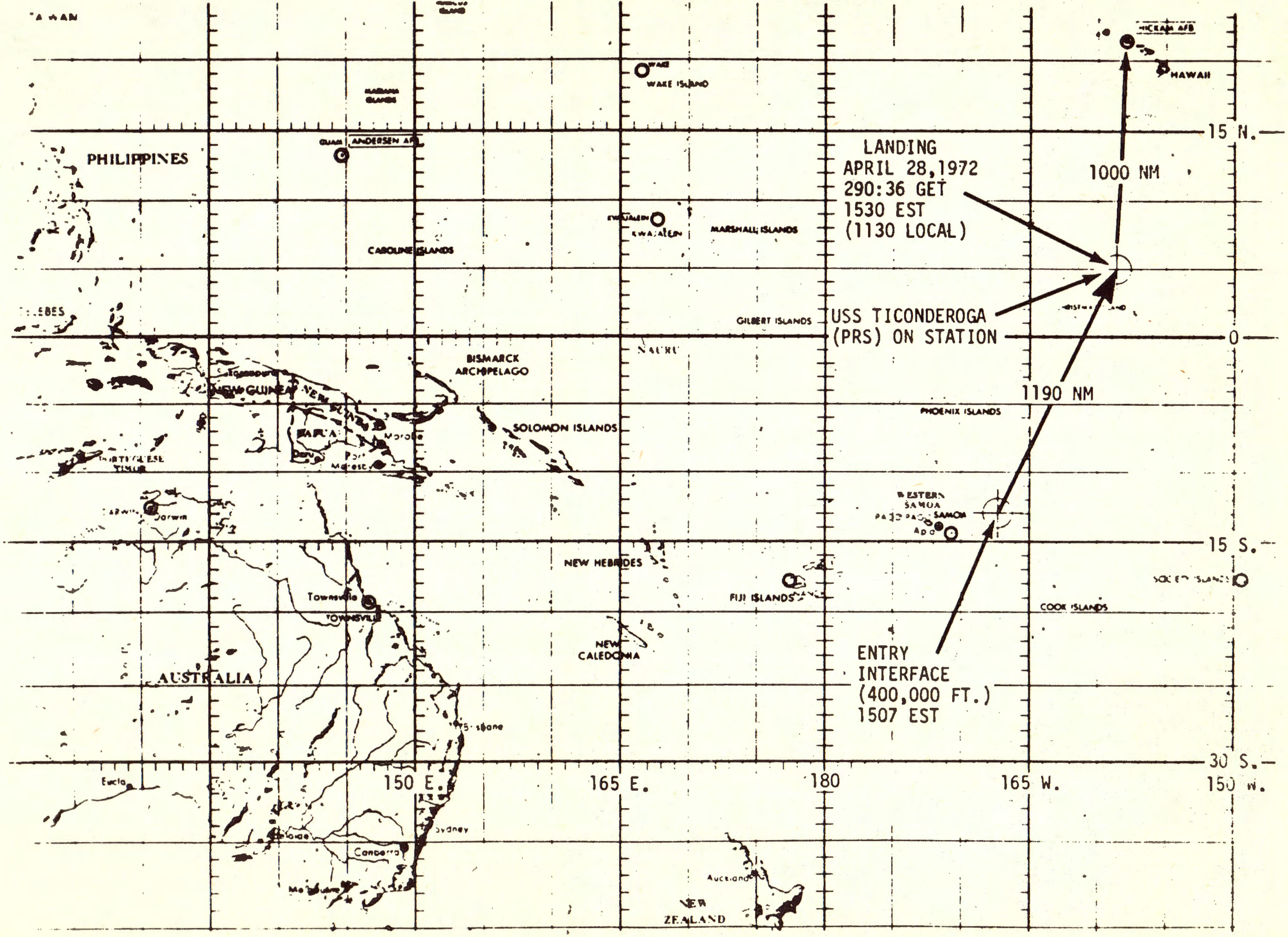
The prime recovery ship is the Ticonderoga. It is about 1000 miles short of Hawaii, probably stage from Christmas Island some of the aircraft.

Next viewgraph, please.

(Slide.)

These are the key dates. Splashdown on the 28th. R plus 1 on April the 29th. Ship should arrive Hawaii -- now, this doesn't mean they are going to spend a day in

APOLLO 16 RECOVERY



LANDING
APRIL 28,1972
290:36 GET
1530 EST
(1130 LOCAL)

USS TICONDEROGA
(PRS) ON STATION

ENTRY
INTERFACE
(400,000 FT.)
1507 EST

APOLLO 16

CREW POST-LANDING ACTIVITIES

DAYS FROM RECOVERY	DATE	ACTIVITY
SPLASHDOWN	APRIL 28	
R + 1	APRIL 29	DEPART SHIP, ARRIVE HAWAII
R + 2	APRIL 30	DEPART HAWAII, ARRIVE HOUSTON
R + 3 THRU R + 15	MAY 1-12	CREW DEBRIEFING PERIOD

Hawaii. It is actually they are arriving just before midnight and the crew will probably be in Hawaii about an hour and then take off for Houston arriving around 8:00 or so in the morning which is unusual. They usually come in around 2:00 in the morning.

And R plus 3 to R plus 15, May 1st to the 12th will be the crew debriefing period. This has not been finalized but I am quite confident that the press will have their briefing just as soon as the crew has their solitary three days of debriefing like we did on the last mission, timed on the same day as the management debriefing. But this has not been verified.

Next viewgraph, please.

(Slide.)

You have been looking at these. I don't think these need any comments unless there are further questions.

We will be going over these continuously. We have never planned but we always do in real time - I feel confident that pending unforeseen circumstances we will probably have a press TV conference on transearth coast shceduled sometime when convenient. But it is not formally scheduled right now.

(Slide.)

Now, we always must consider alternative missions, of course, and if we can't do a TLI we will do an earth orbit mission, photographic mission over the continental limits abou

APOLLO 16 TELEVISION EVENTS

DATE	TIME (GET)	TIME (EST)	DURATION (HRS:MIN)	EVENT
APRIL 16	3:05	1559	0:19	TD & E
APRIL 20	102:25	1919	6:48	EVA-1
APRIL 21	124:50	1744	6:30	EVA-2
APRIL 22	148:25	1719	6:40	EVA-3
APRIL 23	171:40	1634	0:14	LM LIFT-OFF
	173:20	1814	0:06	RENDEZVOUS
	173:44	1838	0:07	DOCKING
APRIL 26	241:55	1449	1:10	CMP EVA

APOLLO 16 ALTERNATE MISSIONS

- EARTH ORBIT MISSION (NO TLI)
  - PHOTOGRAPHIC MISSION OVER U.S. OF ABOUT 6 DAYS DURATION. X-RAY AND GAMMA RAY SPECTROMETERS WILL ALSO BE OPERATED, CMP EVA TO RETRIEVE FILM CASSETTES.
- LUNAR ORBIT MISSIONS
  - APPROXIMATELY 6 DAYS IN LUNAR ORBIT
  - USE OF SIM BAY EXPERIMENTS
  - SUBSATELLITE JETTISON REQUIRED

TYPES OF CONTINGENCIES

- CSM ALONE
- CSM/LM (OPERABLE AND INOPERABLE DPS CASES)
- FROM LM ABORTS

six days' duration.

If we do TLI and for some reason -- say we can't extract the -- undock -- extract the LM -- I am sorry -- from the SLA, we would do a CSM only mission to the moon because we do carry the SIM BAY experiments. It would be about a six-day experiment in lunar orbit.

We will also consider CSM LM, of course, six-day mission around the moon. For example, if we got out there and had the LM and for some reason couldn't land -- one of the legs didn't deploy correctly and so forth -- we would do a six-day mission because we have so many experiments that we can gather data.

Next viewgraph, please.

(Slide.)

I guess walking traverse. I wanted to point out if for some reason we find we can't use the rover, objectives would be to try to get close to the front here. Of course we would deploy the ALSEP, try to get some Caley samples which is a prime objective, and get around Palmetto. We wouldn't be able to get to North Ray Crater. It would be a limited but valuable traverse.

Next viewgraph, please.

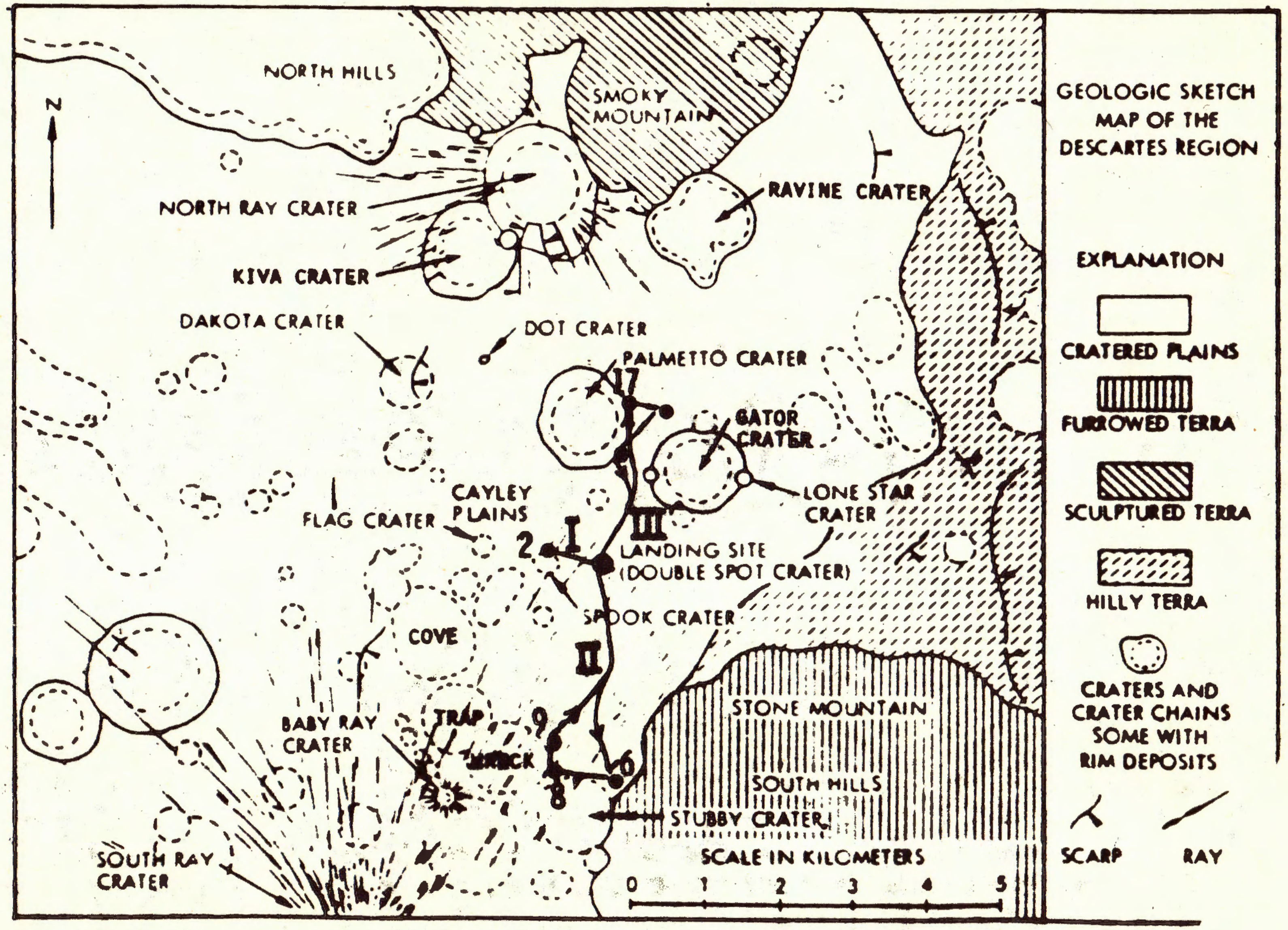
(Slide.)

I just quickly want to give you a comparison here of previous missions, EVA durations and a surface distance

APOLLO 16

WALKING TRAVERSE

(CONTINGENCY)



COMPARISON OF APOLLO MISSIONS

	PAYLOAD DELIVERED TO LUNAR SURFACE KG	(LBS)	EVA DURATION (HR:MIN)	SURFACE DISTANCE TRAVERSED (KM)	SAMPLES RETURNED KG	(LBS)
APOLLO 11	104	(225)	2:24	.25	20.7	(46)
APOLLO 12	166	(365)	7:29	2.0	34.1	(75)
APOLLO 14	209	(460)	9:23	3.3	42.8	(94)
APOLLO 15	550	(1210)	18:33	27.9	76.6	(169)
APOLLO 16 (PLANNED)	558	(1228)	21:00	25.7	88.6	(195)

traverse that is shown quite well here on the surface activities, 15 and 16 as compared with 11, 12 and 14. EVA duration, again a very good comparison.

The hatched line is what we had planned but did not actually carry out.

The distance traversed, as you can see, we didn't actually get as far as we had planned but note how they compare with 11, 12 and 14.

(Slide.)

The remaining schedule. I think you are all familiar with that. We have started the hypergolic loading today. Our next major test, of course, is the countdown demonstration. Wet day is on the 29th of this month. Dry is -- with the crew going through -- is the following day, the 30th.

MSC is still continuing their simulations and the prime recovery ship will depart San Diego on the 23rd of the month and Pearl Harbor on the 8th to take position.

Everything is proceeding on schedule and we are confident and hopeful we will lift off at 12:54 on the 16th of April.

Are there any questions?

QUESTION: First a couple of questions about fixes. You said the -- you were going to use basically the same sub-satellite. That thing lasted something like six months of a

APOLLO 16 MISSION READINESS SCHEDULE

ACTIVITY	MARCH	APRIL
PAD TESTS		
FLIGHT READINESS TEST	▼ 1	
FLIGHT READINESS REVIEW	▽ 10	
COUNTDOWN DEMONSTRATION TEST		
WET (T-0)	▽ 29	
DRY (T-0)	▽ 30	
TERMINAL COUNTDOWN		▽ ▽ 14-16
MSC	SIMULATIONS	UNTIL ▽ 11
RECOVERY		
PRS DEPART:		
SAN DIEGO	▽ 23	
PEARL HARBOR		▽ 8

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year's planned lifetime. What have you done to insure that it will last a year or have you given up?

LEE: We felt we couldn't do anything. Time did not permit us to take the subsatellite and go -- because we are not sure we could correct or have anything better to put in.

We feel quite confident the analyses, based on data we have got here on earth, that the trouble is concentrated in the small I-C circuit, one board in the subsatellite that has messed up the data. And this has progressively gotten worse.

The facts of life are we don't have anything better to put in right now. We think -- we are pretty confident it is a random failure. And we wouldn't delay the launch for it. It wouldn't be commensurate with that. And since we can't go in and redesign -- we probably would have to do a redesign. We just don't have time to do it.

QUESTION: The other question is what sort of fix did you make on the TV camera to make sure it will pan?

LEE: They did some thermal. They have improved the clutch so that we won't lose -- thermal and clutch, primarily, are the improvements made in the TV.

Have I missed any?

(No response.)

We have made -- one thing we are going to do, we are going to run the LCRU on the first two EVAs. We are going to use the rover battery and then we have, we are carrying -- that will allow us to drop off one battery. We will have two batteries for the LCRU. We save nine pounds of weight.

And on the third EVA we will use a battery that we have taken along to help keep the temperature of the LCRU down.

Now, if we run into temperature problems we will probably shift right away to the LCRU battery.

QUESTION: It was off of 12 you got your best pictures for Descartes, wasn't it? Which other missions gave you the best photographic support for planning this?

LEE: I don't recall.

QUESTION: Wasn't it twelve and 14?

LEE: Apollo 14.

QUESTION: Fourteen?

LEE: Yes, we got 500 millimeter. That's right.

QUESTION: If you have already covered this, I don't want to bore people. But when do you figure you will be firing your charges on the moon?

LEE: About three months after we emplace it. Three 27-day cycles.

QUESTION: Now, are you talking about the ones that are already up there?

LEE: No, I am talking about the ones we are going to emplace.

QUESTION: What about the others?

LEE: We left -- we are not sure right now. You know, we said six months after Apollo 16. Three months after Apollo 16. So it may go -- I am sorry, I have been corrected. Six months was correct. Six months after Apollo 16. But we are reviewing this, Peter, and that could change.

QUESTION: Another thing that has interested me throughout these flights, and you have one more to go: what about the names of the various craters that we have dubbed them? Are we going to submit these things to the international whatever it is to make these permanent names or what?

LEE: No. I am sure that process does not permit the names going out like we give them.

QUESTION: What about the names of radio call signs of the two vehicles, do you have them?

LEE: Bill, I have heard them but I am not sure they are right and so I prefer just to let the crew press briefing tell you. I am not sure what --

QUESTION: Tell us. We won't tell them.

(Laughter.)

LEE: I recall one briefing you knew them before I did.

ATCHISON: Wednesday and Thursday.

Hans?

QUESTION: How much hover time reserved do you have after the 1201?

LEE: How much what?

QUESTION: How much hover time do you have?

LEE: We have 150 seconds which has a considerable margin plus right now -- it varies day to day as we do calculations, ISP and all that. Right now we have ten seconds above that. We are about the same shape as on Apollo 15, perhaps a little better.

ATCHISON: Let me say Wednesday and Thursday are mission briefings at Houston and Friday and Saturday are the crew activities at Houston.

Any other questions?

QUESTION: I wonder if after the last flight have you ever made any improvement to the lunar rover at all as far as performance?

LEE: Yes, we have made some improvements on the lunar rover. We have improved the meters we had a little difficulty with. We have improved the seatbelts. You recall Dave and Jim had quite a bit of trouble with the seatbelts and we lost a lot of valuable time on that. We have made a mod to the seatbelts and we have flown the seatbelts in zero G aircraft where they have checked them out and they like them very much. You remember they got hung up. We have made arrangements for them to hang them like when they are not --

when they are off -- like when they are getting off and they are through with them they can sort of hang a little bit and they can engage the seatbelts much faster than previously.

I remember -- I think one of them caught on a switch, as I recall, on the lunar rover. And there are a couple of other improvements.

QUESTION: Any mechanical improvements?

LEE: We did put a circuit breaker, an extra circuit breaker in there to permit us to set up the television after the third EVA so that we can maybe eliminate some of the thermal problems that we had. And not lose the TV as quickly as we did the last time.

You know, we had two problems. We lost the clutch first and then we lost the entire TV.

QUESTION: What was it about the behavior of the RCS fuel that caused you to vent it after 7 and yet permitted you to change that ruling for 16?

LEE: Well, we found in running some further tests that the MMH, the hydrozine, the fuel, from the hot engine, from firing, actually put out a flame ten to twelve feet. It was actually like a flamethrower. And with the spacecraft dropping, with one of the RCS engines right under the chute, it so happens this time that I guess the chute just happened to be in a spot where the flame -- we feel quite confident now that that was what happened -- burned some of the suspension lines.

Now, we ran those tests and we have also run tests making the RCS propellant loading such that it will run out of MMH first. In case we have to. As I said, if we see we are going to land on land we are going to dump and burn just like we did on previous missions. We have made it oxidizer-rich so that we run out of the MMH first and then oxidize what comes out when we purge and finally -- and we have made tests. The lines have held up under those. But we are still not going to do that unless we absolutely have to.

We have mission rules. We have made changes in our mission rules. And we will have a real time call to the crew, feet wet or feet dry. If we give them feet dry they know -- if they should happen to abort, really what it is going to be is when they get far enough into the boost phase that if they had to abort the wind conditions are such that we are confident they will land in water no matter what happens, we will give them feet wet.

And until that time they are feet dry and then they will burn. So we would rather they do that than take the chance of landing with propellants aboard on land.

QUESTION: On Apollo 15 you had a long plan of post-liftoff TV scan the skies for different things. Is there anything comparable to that this time?

LEE: Well, I think the big event the last time was the eclipse.

QUESTION: Did you also have things like --

LEE: Yes, we are going to do that. We are going to have views as long as the rover power lasts. We will try to take TV pictures of the pans of the area at the different sun angles.

QUESTION: But it won't be looking at stars or anything like that, it will just be the lunar surface?

LEE: Not that I know of. We may.

Does anybody know?

(No response.)

I don't know of any plans specifically on that.

ATCHISON: Zack Strickland?

QUESTION: Chet, I believe you said that you might utilize Ken Mattingly as a -- to assist in planning the last of the third traverse? How can he help you in that fashion?

LEE: We have -- well, you know, we have a ten-power binocular. We had a monocular on board which is a single eyepiece and this time we have put a binocular on and we are hoping -- you know, not counting on it, but we know that we designed this -- the geologists predict that there are quite a bit of -- a number of large boulders on the edge of that North Ray Crater and from our current photography, which I think resolution is 15 to 20 meters, we are not sure what the best path is.

Now, we feel perhaps Ken, on some of his runs, for example, on the practice EVAs, he has been able to help the crew in their practice EVAs. We have tried to compare the power of binocular and the altitude he is flying the aircraft here on earth with what he would be able to see orbiting the moon. We hope he may be able to see enough that he can help and say "hey, the traverses you plan look okay" or "Hey, you may have to swing further to the east" or to the west or something like that.

We are hoping. We are not counting on it.

ATCHISON: We have questions at Houston. Go ahead, Houston.

QUESTION: The first mission to the highland, I understood that the Fra Mauro mission was to the highland and I thought also Mount Hadley was a highland mission. What is the difference?

LEE: I understnad your question to be what is the difference insofar as highlands is concerned for Hadley Apennine and Descartes area.

QUESTION: That's right.

LEE: And Fra Mauro.

I guess Hadley Apennine and Fra Mauro were called hilly uplands and this is really the highlands area and I am not sure I can give you a good answer, Ken. One of my backup geology people, can you explain that better than I can? What is the difference? Do you know, Don?

VOICE: Fourteen was uplands, not highlands as such because we were looking at the ejecta blanket of the Mare Imbrium event. We are trying to get to a real highland area, the high albedo part of the moon which is typical of about 70 percent to 80 percent of the moon.

The Descartes landing site is right in the middle of a southern highland block and it is true highlands. It has been modified subsequently, perhaps, in the view of some people, but it is well within the highlands.

The Hadley site, as you know, is on the rim of the Mare Imbrium. We looked at the mountains along the rim of Mare Imbrium, part of which were highlands, but it was not well within the highlands as the Descartes landing will be.

QUESTION: I understand that during the landing the CSM will be almost directly overhead. Do you expect that you will be able to get pictures or a description of the landing from Mattingly?

LEE: No plans for that right now. We don't expect to see it.

QUESTION: We didn't have the viewgraphs down here. What is the 4.2 kilometers that you were referring to on EVA 2? Is that the longest distance they will go on all EVAs or just on that one?

LEE: No. That 4.2 referred to EVA 2 to Station 4 which was to the south and it is 5.5 to North Ray, 5.5 kilometers to North Ray which is a third EVA.

QUESTION: On that Grand Prix, will Young be driving it as fast as it can go, will he be flat out or what?

LEE: If terrain permits I imagine he will give it the max speed. He will use his judgment on that. They want to see several things and they would like to see a higher speed and that depends, of course, on his good judgment and the terrain features where we do the Grand Prix.

ATCHISON: Any further questions here in Washington?

(No response.)

Okay, we will take a break for about two or three minutes and come back with Dr. Charles A. Berry.

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(Recess.)